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AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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The "Robb-Armstrong" Engine.

We illustrate on this page a new single-valve automatic engine recently brought out by the Robb Engineering Co., of Amherst, Nova Scotia. In general appearance it does not differ greatly from several popular high-speed engines, and no radical departure has been made in principles of construction, the aim being to combine as many as possible of those points which have proven best in practice, with such improvements in details as have been suggested by observation and experience with other engines. In other words, it is not an attempt to develop a new species, but to advance one step in the evolution of that already highly developed machine, the American high-speed engine. The following is a brief description of the main features.

The frame is of the "Porter" type with double-disk crank; it has considerable sectional area, carried well above the center line, and is particularly thick at the top, thus bringing the metal in the direct line of strains between the cylinder and shaft bearings. The engine weighs a little over 100 pounds per horse-power, not an unusual weight, but the metal is distributed to give the greatest attainable stiffness, and without much regard to the "anvil principle," the foundation being expected to furnish all the weight required in that direction at less cost.

The crank is "built up" of cast disks and forged steel pin and shafts, the peculiar arrangement of the crank permitting the fits of the shafts and pin in the disks to be very long, without separating the shaft bearings unduly, as is shown in the cross-section at the right of Fig. 2; the counter-weight is of equal moment with the reciprocating parts. The shaft bearings run in cast-iron shells, babbitted; they are not provided with means of adjustment for wear. The bearings are finished by grinding operations of great delicacy, and are round and parallel within a limit of variation smaller than the average machinist will usually detect, even with the aid of the micrometer. The shafts are made to gauge, and the shells are interchangeable, as are the other parts of the engine; hence, a duplicate set of shells may be kept for emergencies. The crank is covered by a cast-iron case, shutting it completely in except at the slot through which the connecting rod works. The crank disks are without the usual finished flanges on the periphery, the crank case being designed to have a substantial and finished appearance, and free access is given to the crank-pin box, when the hinged crank case is raised. The crank-pin is oiled through two ¼" holes, one extending from each side of the crank to the center of the crank-pin, all oil wasting from the inner ends of the shaft bearings being instantly carried to the crank, while all oil wasting from the outer ends of shaft bearings is caught, and by a ring riding on the top of shafts and dipping into the oil below, is returned again and again to the bearing, until it finds its way to the crank-pin and escapes to the crank pit, to be drawn off and filtered. In practice the crank-pin does not need oiling other than as stated, but a sight-feed oil cup is provided in addition to those oiling the shaft bearings, which will, if desired, feed oil direct to the crank-pin through one of the ¼" holes before mentioned.

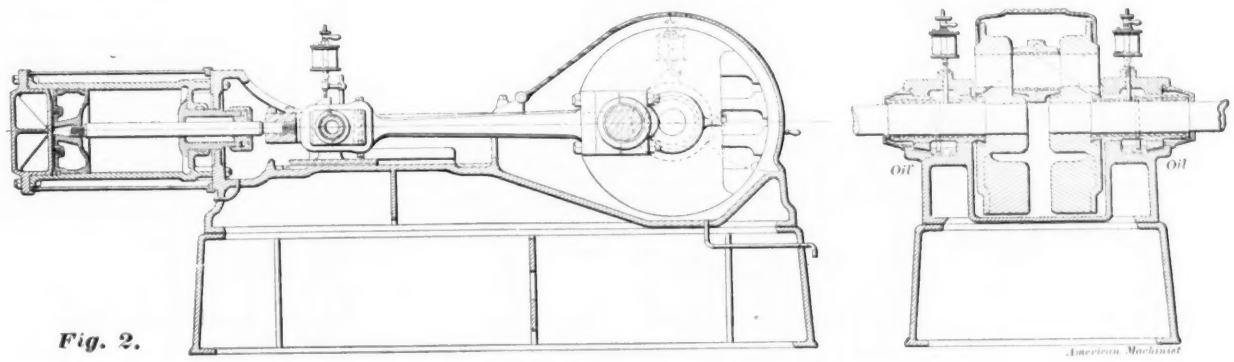


Fig. 2.

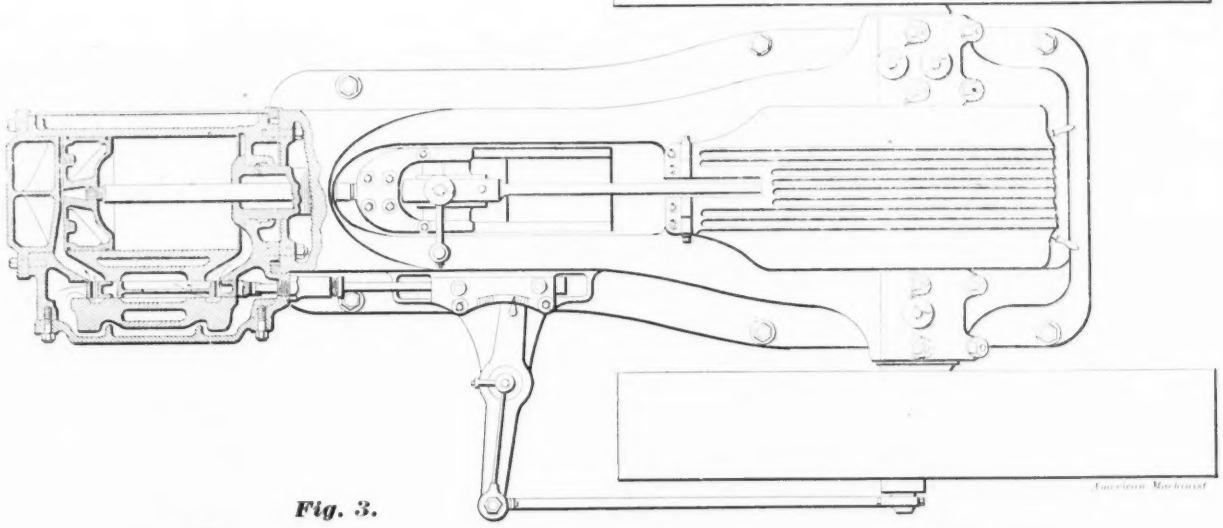
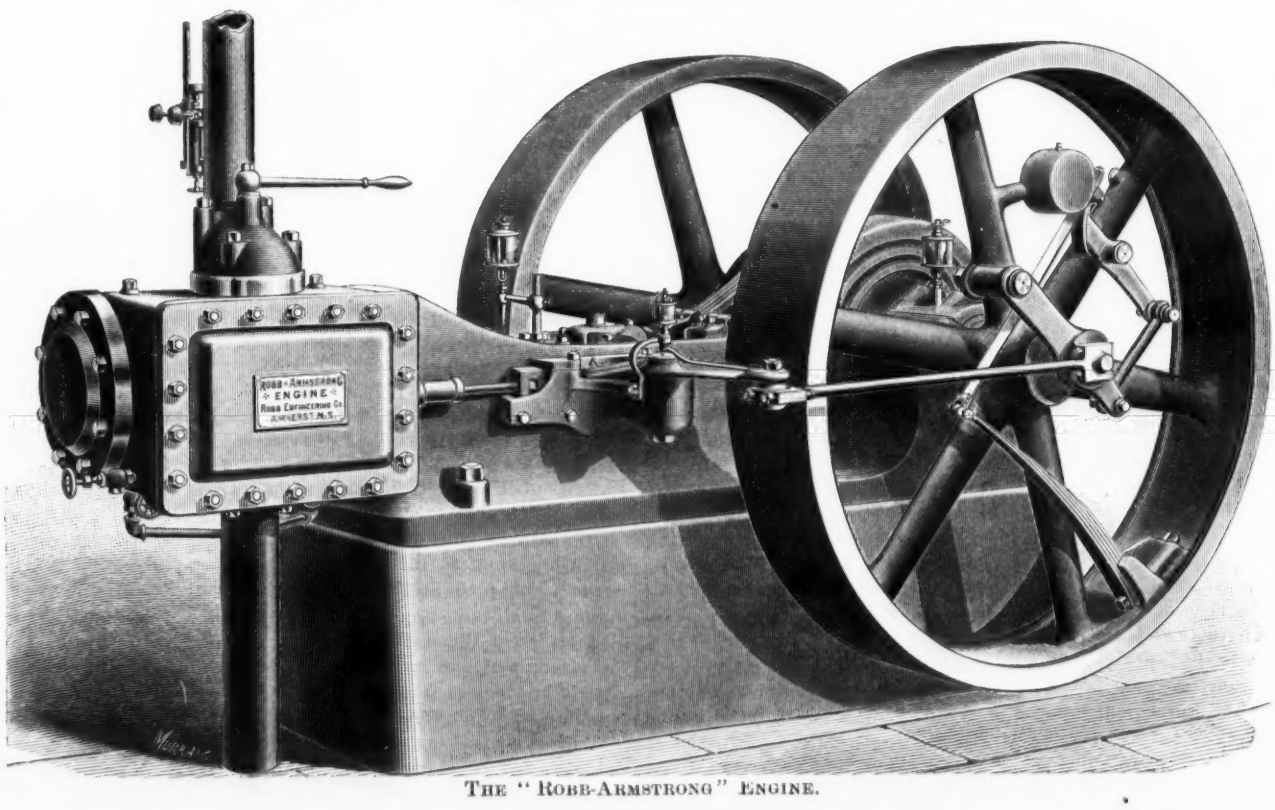


Fig. 3.



THE "ROBB-ARMSTRONG" ENGINE.

The fly-wheel governor is a modification of the "Straight Line," and, together with the valve, is used by arrangement with the Straight Line Engine Co.; the oiling devices mentioned will also be recognized as essentially "Straight Line."

The eccentric rod, so called, although there is no eccentric, has ball and socket bearings at each end, the balls being case-hardened and ground, and the sockets or boxes of phosphor bronze. The rocker arm, by which the eccentric rod drives the valve, is horizontal, with a vertical axis; there is no twisting strain on either of its bearings, a straight line passing through all three of them. An index finger attached to this arm, as shown in plan view, Fig. 3, shows, by the graduations over which it passes, the movement of the valve, and thus is of assistance in valve setting.

A small sight-feed oil cup, directly over the center of the rocker arm, supplies oil through a tube to the outer end of the arm. The eccentric rod is hollow, being, in fact, a piece of hydraulic pipe, and through it the oil passes to the eccentric pin, any oil finally escaping being caught and held in the flanged fly-wheel.

The center bearing of the rocker arm works in a bath of oil so arranged that it is constantly flooded, and so that no oil can escape to the floor, any overflow draining to the crosshead guide, and finally to the crank pit.

The crosshead is a single steel casting, of the "Slipper" type, the bottom of the slipper being babbitted. The piston rod is secured by being gripped in two places, about two inches apart, one place being threaded and the other a parallel fit. The crosshead is split and is gripped onto the rod by bolts; this proves very good, in that it can be taken apart and put together again without getting out of line more than permissible in the highest grade of engine work—a point in which the usual methods of securing piston rods to crossheads (with the exception of the taper fit and key) are often faulty. The crosshead pin is of cast-iron, as it is believed that, in connection with the large and long bearing, it is the best material for the place. The connecting rod is a steel forging, the crank end being of the "Marine" type, while the crosshead end is mortised for boxes, which are cast-iron, lined with babbitt. The adjustment is by a wedge and adjusting screws.

The babbitt used in the engine is made from eight parts Banca tin and one part each of antimony and copper. The piston is a single casting with sprung rings; it is made extremely light, both to save the cylinder from wear and to make it the "breaking-down piece"; though amply strong for all legitimate loads it is expected to be weaker than other parts, the idea being that it is the best thing to break, when experiments to determine the compressibility of water are being made with it. The exhaust passages are jacketed by air spaces from the cylinder, and from the live steam in the steam chest. The throttle is a modification of the "Coffin Valve" used by the Straight Line Engine Co., but is operated by a lever instead of a wheel, or ball handles.

The workmanship is intended to be equal to that of any other engine built. The firm also build cheaper automatics, but this engine was brought out to fill a demand for which they have previously been obliged to import the best and highest priced American engines. The engine was designed and its manufacture organized by Mr. E. J. Armstrong, who is now with the Ames Iron Works, Oswego, N. Y., which company will also build the engine in this country.

Planing and Milling Irregular Forms.

In the AMERICAN MACHINIST for January 28th, Mr. Taylor describes a method for boring or turning any irregular form by attaching to the tool rest a scriber, the point of which is made to traverse the line of a drawing or diagram which corresponds to the outline of the shape of the piece it is desired to bore or turn. In the February 18th issue, "A Mechanic" describes a method of planing irregular forms by fastening to the platen of the planer a template of the desired shape, letting a roller attached to the vertical slide of the head rest upon this template, and thus move the slide and tool up and down as the template and work travel under it together, the screw being removed and the slide weighted to keep the roll down upon the template. Mr. Whitehead again refers to the matter in this issue, and as the principle shown is capable of wide application, it may be worth while to mention a feature of this method of producing irregular forms which is not referred to in any of the communications mentioned. The point I wish to call attention to is, that the devices referred to will not reproduce the form of the template used unless special provision is made for doing this, the variation between the shape of the template and that of the work depending upon the variation between the form of the cutting tool and that of the roller or scriber which traces the line, modified also by what may be called the degree of irregularity of the form to be produced. This arises from the fact that the motion of the slide corresponds to the motion of the center of the roll, or, in other words, to the motion of any point in a line drawn vertically through the center of the roll. As the point of contact of the roll with the surface of the template will not be always, and, in fact, seldom is in this vertical line, there must necessarily be a variation between the template and the work.

To make this clear, we will consider the application to a planer, and suppose that *a*, Fig. 1, is a template which is secured to the platen, *r* being the roller which is attached to the vertical slide of the planer head. Now in passing over the template, the center of the roll will obviously be always at an equal distance from the face of the template, and will therefore follow the dotted line, producing instead of the arc $h\ i$, an arc $h'\ i'$ with *g* as its center; and instead of reproducing the arc *b c* of the template, the sharp point r' will be produced, its location being in the center of the arc *b c*. This results from the fact that the radius of the arc *b c* is equal to that of the roller, as shown, r' indicating the position of the center of the roller. Then instead of reproducing the arc *d e*, an arc $d'\ e'$ with its center coinciding with that of arc *d e* is produced, the radius of arc $d'\ e'$ being the greater by the radius of the roll, as in the case of the arc $h'\ i'$.

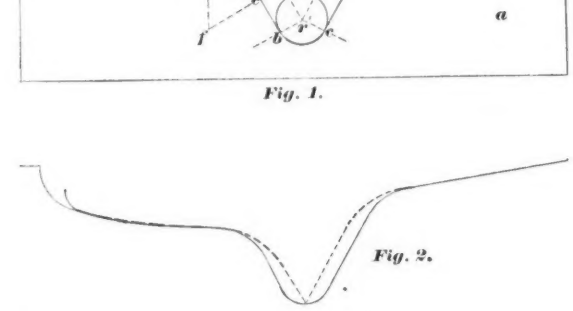


Fig. 1.

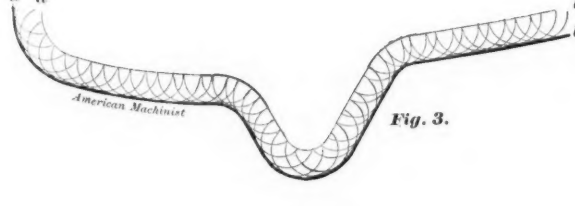


Fig. 2.

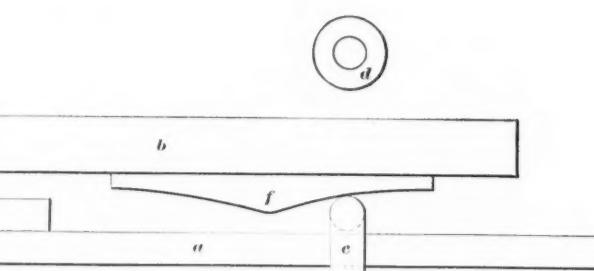


Fig. 3.

Fig. 4.

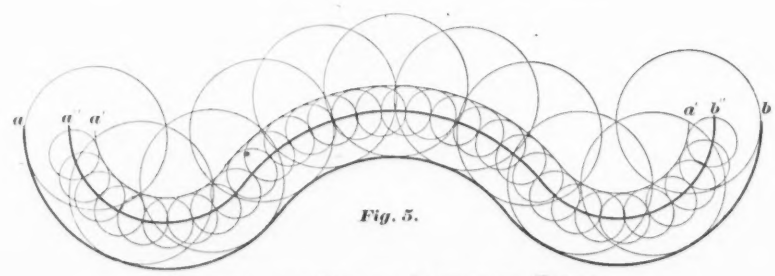


Fig. 5.

PLANING AND MILLING IRREGULAR FORMS.

Stated in general terms, we may say that the radius of curvature of any concave surface produced in this way will be decreased by an amount equal to the radius of the roller, while the radius of curvature of any convex surface will be increased a like amount. The degree of correspondence between the template and the surface produced in this case is shown by Fig. 2, in which they are superimposed, with the right-hand extremities coinciding. Of course the form shown would not be practicable to produce perhaps on a planer, but it could be produced by bridge milling where the same principles apply, and with any template of less curvature, or of a more regular form, the error is there, though of course not so readily perceptible.

Having shown that a template of the exact form of the work will not reproduce itself, the question is how we shall determine the form of template to produce a given form. To do this we have only to lay out the form of the work, and, having decided the size of the roller we are to use, draw another line parallel to the first, and at a distance from it equal to the radius of the roller. Suppose, for instance, we wish to reproduce a form corresponding to that of the template *a*, Fig. 1. We draw a line *a b*, Fig. 3, of the desired form, and, taking many points on this line as centers, we strike arcs as shown, the radius of these arcs being equal to the radius of the roller we are going to use. A line $a'\ b'$ drawn tangent to all these arcs is the desired form of template. When the form is regular, the striking of the numerous arcs can obviously be dispensed with, and the line of template be drawn directly.

It is obvious that the same principles apply to Mr. Taylor's boring of irregular forms; the simplest way of getting over the difficulty in this case being, probably, to make the tool round in form, and then use on the end of the scriber a disk of the same radius as that of the tool, keeping this disk tangent to the line drawn for guidance. Of course, if both the tool and the scriber were formed to sharp points the result would be the same, but tools made in that form have their objections, as we all know.

In bridge milling which is done with a fixture something like that shown at Fig. 4 this point has to be looked after. In this figure *a* represents the platen of the milling machine, *b* a plate to which the work to be milled is secured, *c* the bridge and *d* the milling cutter. The plate *b* is hinged at *e*, and weighted at the other end to keep it down to the bridge. What corresponds to the template in this case is seen at *f*, and is secured to the under side of the plate *b*. It usually rests upon a roller at the top of the bridge. Where practicable this roller and the milling cutter are made the same diameter to simplify matters, the template in this case being the same form as the work. But it is not often practicable to make the roller on the bridge so large as it is advisable to make the cutter, and in this case the radii of the concave portions of the template are equal to those of the desired form less the difference in radii between the cutter and the roller, while the radii of the convex portions of the template are equal to that of the desired form plus the difference between the radii of the cutter and roller. This is shown at Fig. 5, where the line *a b* is the form which it is desired to reproduce, the larger circles representing the milling cutter and the smaller circles the roller, the latter being one-third the diameter of the former. In order to reproduce the line *a b*, it is seen that the center of the cutter arbor must be kept on the line $a'\ b'$, and to do this the center of the roller must be kept on the line $a''\ b''$, this latter line being the desired template, which can as well be laid off at once by striking arcs at points along *a b* as centers, and with a radius equal to the difference in the radii of the cutter and roller. Of course it is to be understood here that in the case of bridge milling the motions of the cutter and roller are relative to the template and work only, as the latter really do the moving in this case.

Practically such forms are often produced by using the model piece of work or a piece made like it, which is fastened to the top of plate *b*, and passed under a roller which is the size of the cutter it is proposed to use, while directly below it is a milling cutter of the size of the roller it is proposed to use; this milling cutter, then, produces the correct form of the piece *f*, the plate *b* being kept pressed upwards against the roller. When more convenient, the position of the roller and of the cutter can be transposed, the plate *b* being in this case turned upside down.

FRED J. MILLER.

The following item we take from a letter of Harold Frederic, the European correspondent of the *New York Times*:

"A discovery is reported at Helsingfors, of an ancient chest, containing a lot of curious pieces of iron machinery with a mass of parchments, the latter being a treatise on the possibility of applying steam to mechanics, while the machinery is a very tolerable approximation of the steam engine of a century ago. Both iron work and documents purport to have been made by Suger, the famous abbot of St. Denis, and administrator under two Kings of France in the twelfth century. Great interest will, of course, attach to the investigation of the authenticity of these antique remains. If they really are Suger's, he will have a new distinction as antedating all the other pioneers of steam application, by hundreds of years."

Little Poetry in His Soul.

I was talking to the telegraph operator during a lull in his work, and with some degree of awe was dilating upon the mysterious power he controlled with a finger tap.

"It's a wonderful thing, isn't it," I said, "this chaining of the lightning?"

"I've always understood chain lightning was no slouch," he responded, rattling the key of his instrument.

"Your work is most interesting, I should say," I continued, "when the messages go flashing over the wires."

"I never saw one flash, I think. They just go ticketty-tick-tick mostly, unless a wire's down."

"But in moments of exciting events the wires are kept hot with flying messages, aren't they?"

"I never went outside to feel a wire," he said slowly, as if he wanted to be sure he was right, "but I don't think the wire ever sets the telegraph poles on fire."

"The lightning-like rapidity with which—" I began, with a sense of something unsatisfactory in the difference of opinions we held, and feeling that the operator had no poetry in his soul, when he made a grab for the key and for the next ten minutes was so busy swearing at something that I became very tired and walked out of the place. —*Detroit Free Press.*

Improved Sawing Machines.

The first of the illustrations on this page represents what is known as the "No. 2 railway cut off saw," in which the arrangement is such that a carriage which carries the saw arbor is moved along on top of the bed upon planed ways to which it is gibbed over the outer edges, as shown.

The belt is arranged to run over an idler shown at the left of the engraving, this idler being supported in a bracket which slides upon a planed seat and is moved by the hand-wheel and screw shown.

The object of this is to adjust the tension of the belt, which can be made endless if preferred. It passes over the pulleys in such a way that it embraces over two-thirds of the surface of the mandrel pulley, and its tension is equal at all positions of the carriage, so that there is no tendency to slack speed in sawing heavy timber caused by slack belt tension.

Counterweights return the carriage to its place when released, and the movement is made as easy as possible.

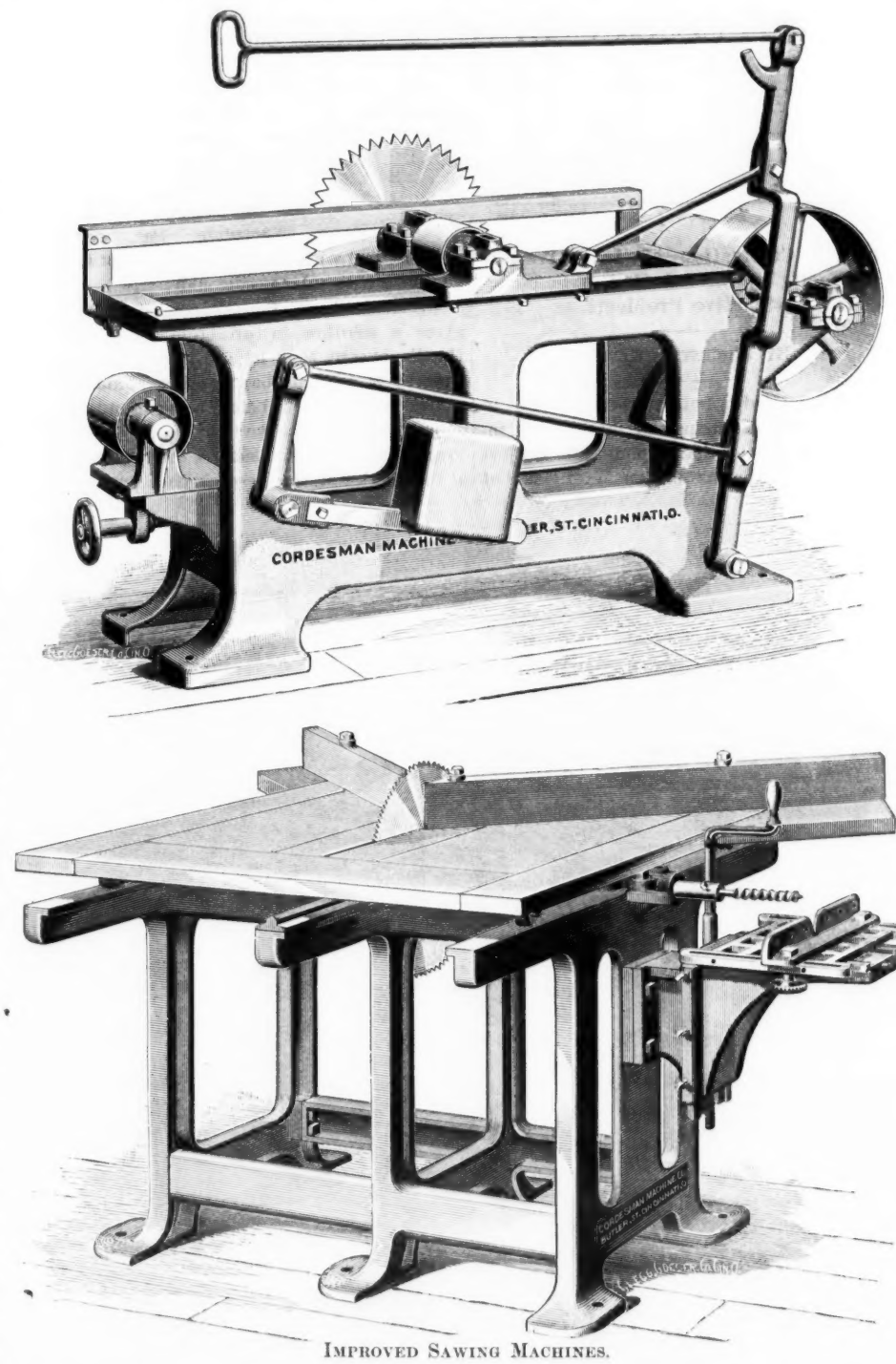
The frame of the machine is cast in a single piece, and, as will be perceived, is of very substantial design, calculated to withstand the severe usage to which such machines are generally subjected.

The mandrel is of steel, finished by grinding, runs in babbitted self-oiling boxes, and is supplied with an improved expanding device by which saws having different diameters of holes may be used without bushing.

When desired a table is furnished with the machine, which is made of iron bolted to the frame, so designed as to prevent any accumulation of sawdust. Fitted to this table is a fence that can be used at either end of the table. The table has an adjustable stop, and is accurately spaced off in inches.

The second illustration is of an improved miter cut-off saw, which is made either with or without the boring attachment seen at the right. The frame of the machine is of iron, the table of wood, 4 feet long, 3 feet 8" wide, finished in shellac varnish. It is made up of a number of strips of maple tenoned and glued together to give security against warping or splitting. It is supported on rollers at either side, and upon a V slide in the center. A spring is attached which returns the table after the miter is cut. The fences and extensions are made of extra length (in fact, somewhat longer than shown by the cut), and are accurately at right angles with each other.

The boring attachment is adapted to many kinds of horizontal boring. It is supported upon a bracket which is bolted to the side of the frame, upon which is fitted a knee which is raised or lowered by the screw seen. Upon this knee is a table which is arranged to slide to or from the bit. There is a pin stop to gauge the depth of the hole. These machines are built by the Cordesman Machine Co., Cincinnati, O.



IMPROVED SAWING MACHINES.

The Electric Search Light in Warfare.

A very interesting and satisfactory experiment was made with the search light on Saturday last at Elstree, in Hertfordshire, in connection with some night maneuvers which were being carried out by the London Rifle Brigade. Captain Ronald A Scott, of the West London Rifles, who was asked only a few days before as to whether it was possible to provide and work a search light at Elstree on this occasion, readily agreed to the idea, and threw his whole energy into the matter in order to make it a success. It was no slight undertaking at almost a moment's notice, and the ground, being more than ankle deep in mud, did not render the fixing of the plant an easy matter. However, all the apparent difficulties gave way before hard work and determination, and everything was ready, as far as the search light was concerned, at least an hour before it was necessary to throw the beam. The success of the search light upon this occasion was most undoubted, and it will be seen from the notices in the daily press that to its use is credited the result of defeating Major Marshall's attack just as he appeared to be sure of victory. The light developed was 25,000 candle-power, the mirror used being one of Ronald Scott's patent, as supplied by him to the Lords of the Admiralty, Indian Government, Messrs. R. A. Crompton and Co., etc. The search light apparatus used on this occasion was precisely similar to that worked from the top of the grand stand at the naval exhibition last year, and to that which throws its beam nightly from the front of the Crystal Palace. Captain Ronald Scott is a member of the Institution of Electrical Engineers, also of the Royal Institution and the Royal United Service Institution, and is well known as a manufacturer of search light apparatus, which he has supplied to the English and foreign governments.—*London Engineer.*

The Board of Trade report as follows on an accident to a train on the Metropolitan (English) Railway:

"The accident must be attributed to the fracture of the right leading axle box of the sixth vehicle from the engine. After the accident the bottom part of this axle box was gone, and the only piece of the bottom which has been found was picked up about 200 yards after the first mark of derailment, and about 440 yards from the place where the vehicle eventually stopped. The driver and fireman of the train were quite unconscious that anything was wrong, until a crossing close to King's-cross station—nearly 600 yards from the first marks of derailment—was reached, when the driver and fireman felt a drag just after steam had been shut off to stop at the station, and then a sudden stoppage of the train by an application of the Westinghouse brake from behind the engine, the speed at the time being from twenty to twenty five miles an hour. The front guard was unaware of anything being amiss till he felt the train suddenly stopped by the application of the brake, just as the front vehicle had reached the Farringdon street end of King's-cross island platform. The rear guard, Howard, was also unconscious that anything was wrong until he felt the rear vehicle, in which he was riding, leave the rails on its reaching the crossing at the mouth of the tunnel, about 100 yards from the Farringdon street end of King's-cross island platform. He at once with great promptitude applied the Westinghouse brake, which acted well and stopped the train in about 15 yards, just before the front of the sixth vehicle had reached the pier of an over-bridge between the widened and main lines, which pier it would have otherwise struck, with probably disastrous consequences. Howard deserves commendation for this prompt action."

Technical Education.

The principal work of a technical school is the teaching of science, and not, as many suppose, to turn out fully fledged engineers, architects, manufacturers and tradesmen; all that it can pretend to do is to turn out partially educated men. The graduates must supplement the work in the school by practical experience in after life, before they acquire the right to call themselves practical men.

The practical work of the school differs in many respects from the practical work of actual life. Where it is work of the same kind, as, for instance, drawing, designing, the use of surveying instruments, lathe work, smith work, etc., yet the feeling of reality and responsibility is lacking. It is a very different thing to make mistakes in school work from making mistakes in similar work in actual life. A man is vastly more impressed by the necessary punishment which follows mistakes in the serious business of life than he can be by the arbitrary penalties instituted by the faculty.

Again there is a great body of knowledge necessary to complete a man's practical education, which it would be only an utter loss of time to attempt to give in a school, simply because there are no well-defined threads of scientific thought upon which to string it. Three-quarters of the information to be found in an engineers' hand-book would be useless in the curriculum, although all important in practice. Such knowledge becomes useful only when impressed by experience.

The establishment of engineering laboratories marks a new departure in technical education. Surely, it will be said, the work in these laboratories is practical. So it is, but not perhaps in the sense in which the question is put. The steam engine in an engineering laboratory is not used for the same purpose as the factory engine. In the shop it is used for manufacturing purposes; it is placed in the laboratory for the purpose of being experimented upon. In the laboratory it is tried at different speeds, worked condensing and non condensing, with varying steam pressures, with and without steam jacketing, with different amounts of lead and cushioning, with different counterbalances for crank and connecting rod, with varying clearances, with simple and multiple expansion. The work done at the main shaft is accurately measured; likewise the work in the cylinder—the feed water and condensing water are weighed—the degree of dryness of the steam determined. In short, in the laboratory all the conditions which may affect actual practice are experimentally investigated. It is only in this way that the principles governing the construction and action of engines can be fully determined.

What would an employer do with a man who should attempt any such work with the factory engine? He would simply give him to understand that his usefulness was gone, and that he had better look for employment at the School of Practical Science.

[Extract from an address by Professor Galbraith before the School of Practical Science at Toronto.]

The Annual Convention of the American Railway Master Mechanics Association will be held at Saratoga on June 20. Headquarters will be in Congress Hall Hotel.

Nut-making Machine.

We illustrate herewith a new machine for making hot pressed nuts, it being of the type which has two crankshafts driven from a pinion which is between them and on the fly-wheel shaft, the gears being shrouded to the pitch line, so that the shrouding runs together and conduces to smooth action, as well as strengthening the gears.

In operation, the bar is fed into the machine by the operator, and the blank is cut off by a plunger worked from one crankshaft, which carries it forward into a die box in which is the crowning die which shapes the top of the nut. Through the center of this die works the piercer or punch which makes the hole in the nut, this being operated by a rapid cam motion on back shaft. The "punching," or the piece punched out from the nut, is carried forward through the center of the hollow cut-off punch or tool, and when this moves back it is followed by the crowner die, which strips the nut off the punch or piercer, and pushes it out of the die, so that it falls into the chute seen under the machine. The punching is ejected from the hollow cut-off tool when it is receding by a short punch rod, which strikes a projection on strap near main shaft box.

The amount of pressure which shall be put on the nut is adjustable while the machine is running, by means of two set-screws; a picker insures the delivery of every nut as made, and the operation of the machine is therefore reliable and uniform. The fly-wheel is made of large diameter, to enable the machine to be the more easily turned by hand when setting dies. The machine weighs about 9,000 lbs. It is built by the National Machinery Company, Tiffin, O.

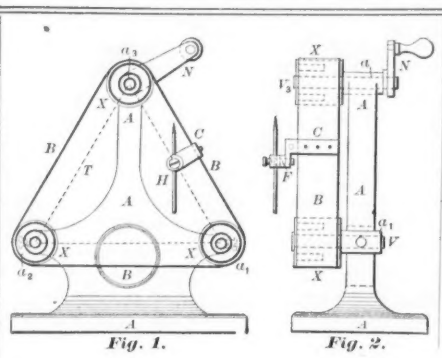


Fig. 1.

Fig. 2.

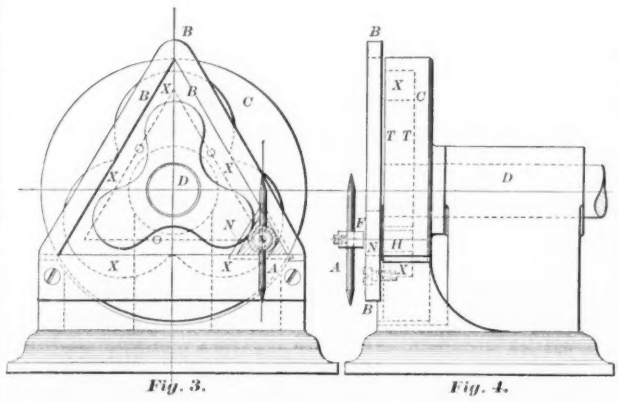


Fig. 3.

Fig. 4.

On the Cultivation of Inventive Capacity by the Solution of Constructive Problems.

By Leicester Allen.

I shall herewith notice other solutions to the problem of triangular motion not included in the article upon this subject published in the American Machinist of as the modest manner in which they forward their work, is full of promise for a great many of them. Never, until I commenced this series of articles, and began to receive responses from these young men, have I had anything approaching an adequate conception of the educational value of such a publication as the American Machinist, though I have long ranked it at the head of publications devoted to applied mechanics.

The solution of Prof. Hood has been several times substantially duplicated by others whose solutions were in hand at the time his was published. Of those that may be classed with his are the following:

Mr. Charles S. Beach, of Bennington, Vt., sends a solution which differs only in using a forked rotating arm, in which the pin of the needle slide plays, and in making this slide triangular instead of hexagonal.

Mr. Joseph Myer, of Scottdale, Pa., sends one identical with Prof. Hood's, except that he uses a triangular needle slide.

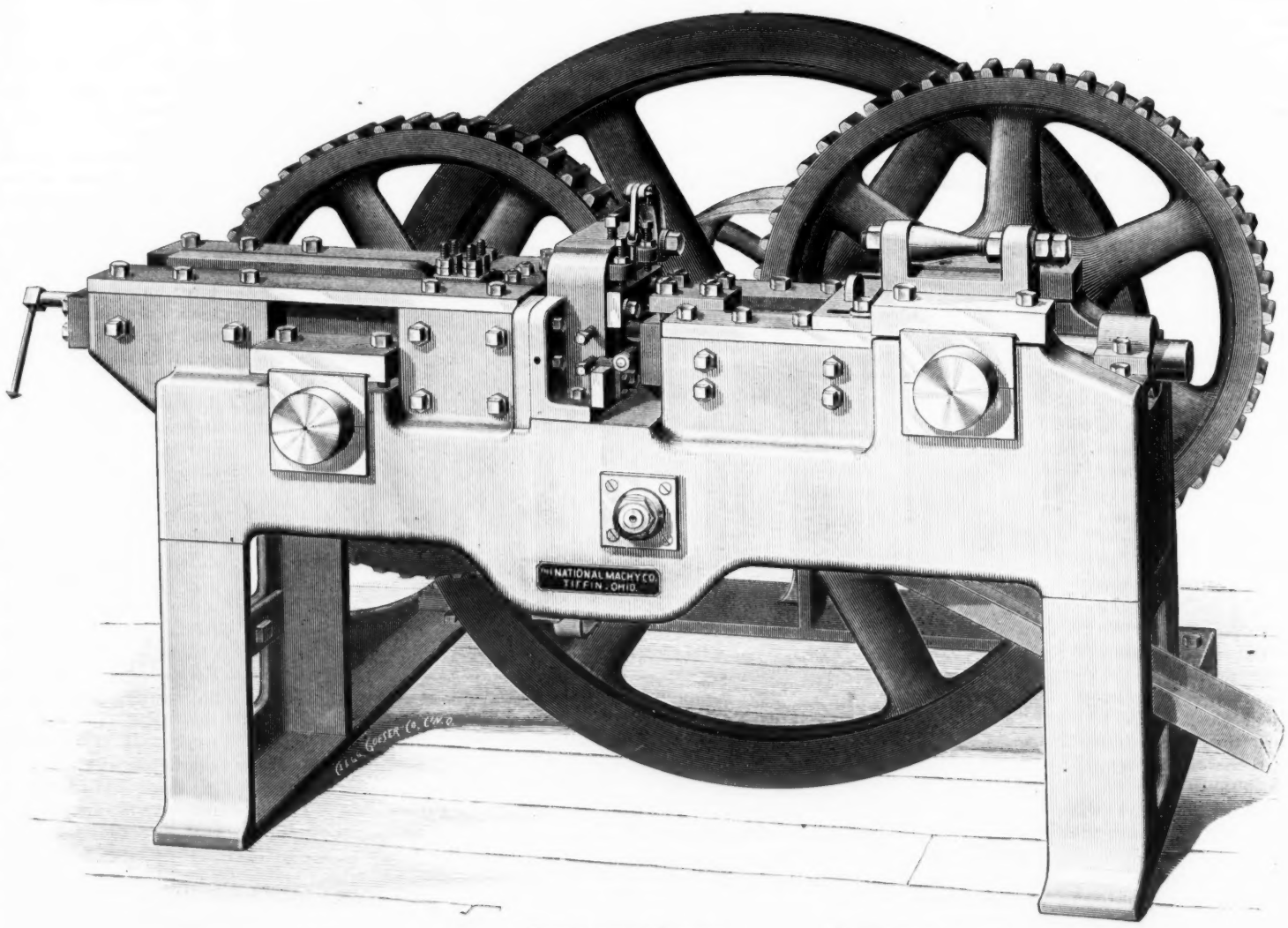
Mr. L. C. Sharp, Plattsburgh, Nebraska, gives a solution in principle like Prof. Hood's, except that he moves a triangular slide by a rotating bar working against a central pin, the bar being curved, and the concavity of the curve being on the side toward the pin. This makes the movement at the angles of the needle's path easier in Prof. Hood, except that he uses no spring but keeps the hexagonal slide in its path by an interior as well as an exterior triangular guiding edge, or, in other words, runs it in a triangular groove.

Mr. Francis W. Clough, of Springfield, Mass., has forwarded two different solutions, one of which, shown in Figs. 1 and 2, is, in principle, something like that of Mr. J. K. Love, of Waterbury, Conn., described and illustrated in my previous article. Mr. Clough has shown belts and pulleys instead of sprocket wheels and chain, and his arrangement will turn the angles, which could not be done in Mr. Love's arrangement. Nevertheless, with this arrangement there exist two defects. At each angle of its path, the center of the needle will remain at rest during a definite period, that is to say, while the pulleys turn through an arc of 120 degrees, and in the problem, as stated, the movement was required to be theoretically continuous. Moreover, the direction of the axis of the needle in this arrangement is controlled by gravity, so that the movement is only operative when the needle moves in a vertical plane. This feature of vertical position violates no condition of the problem as I presented it, but, with anything but an almost infinitely slow motion, the needle will swing like a pendulum when it comes to rest at each of the angles, owing to the momentum of the pendent end.

In the Figs. 1 and 2, A is a vertical frame supporting the pulleys $a1$, $a2$, $a3$, carrying the belt B, so that turning the crank N causes the three pulleys and the belt to move together. An angular support C is riveted to the belt, and to this, as shown in Fig. 1, the needle H is loosely pivoted somewhat above the middle point. Thus, except for its oscillations at the angles, it would always remain nearly parallel to itself; theoretically however, the effect of applying the force at one side of its center of gravity will cause the needle to incline somewhat from the vertical position in any of the three lines of its path, and as this inclination will be reversed according as the movement is toward the right or toward the left, it follows that the needle, in traversing across the base of the triangle, will not take a position exactly parallel to that it holds in traversing the other sides.

This point has been dwelt upon because others have adopted the principle of gravity in their solutions, as competent to maintain parallelism of position in the needle.

Another solution sent in by Mr. Clough, meets, in a very complete manner, not only the exact requirements of the problem, but also reaches beyond them, exhibiting a means not only for moving the needle block past the angles with less friction, but also showing how the needle block may be made



Nut-Making Machine.

On the outside of the envelope in which the catalogues of the Straight Line Engine Co. are mailed, is the following legend: "Standard Size Catalogue, 6x9 inches, Conforming in Dimensions of the Publications of the American Society of Mechanical Engineers."

There is no earthly reason, so far as we can see, why more catalogues should not conform to these dimensions. Any number of them are issued that are so near to it that it is easy to see that they might just as well have been the exact size. And if the importance to all concerned of having standard size catalogues were fully understood, the very little trouble necessary to arrange for it in most cases would be taken, to the great advantage of all concerned. We shall hope to see more of such inscriptions on catalogue mailing envelopes. They perform useful educational work. Many of the arguments in favor of standard screw threads and other parts of machinery with which our readers are familiar can as well be applied to catalogues.

March 17th. A very interesting one has been received from Mr. F. H. Williams, secretary and treasurer of the Fleniken Turbine Co., of Dubuque, Iowa, of which he has promised to send a scale drawing, and which differs from any of those yet sent in.

Accompanying the solutions, and very numerous attempted solutions, is a very unanimous expression of continued interest in and approval of these problems, much of it coming from very flattering sources. Young mecbanics appear to seize upon the problems presented as a means of self-improvement, and their earnest efforts, as well

one direction, but I hardly think the passage of the slide by these points in the reverse direction could be made, as a tangent drawn to the convex side of the curve becomes almost coincident with the side of the triangular guide. He explains that the bending of the arm makes the motion of the slide more uniform than if the arm were straight; but he has not demonstrated this proposition, which, I think, a rigid application of geometrical methods would show to be faulty.

Mr. T. J. Hickey, of Pittsburgh, Pa., solves the problem in the same manner as

to make only one circuit while the driving shaft makes two revolutions. I think it possible, moreover, that by a proper construction of the cam groove, a uniform motion of the triangular slide can be obtained. Also by an extension of the principle he has brought out, the block can be made to pass a much more acute angle than one of sixty degrees, so that the solution is a general one for motion in any triangular path, the only modifications needed being an alteration in the form of the cam groove *x*, and a change in the form of the sliding block, making it geometrically similar to the path it is to describe. Mr. Clough thinks the limit of possibility of moving is nearly or quite reached in solutions given in the previous article, but a model in my possession shows that, unless the spring is much too stiff, the slide passes the angles with entire facility, even without lubrication. Mr. Clough explains his movement as follows:

"The needle *A*, Figs. 3 and 4, is fixed to the triangular block *N*, having on it studs *F H*. The needle is attached to *F*. The stud *H* supports a hardened steel roll ground to fit the groove *x* cut in the face of the disk *C* to a depth *T T*, Fig. 2, and *C* is mounted on the shaft *D*. The block *N* is moved by means of the face cam *C x* in a circuit of a steel former *B*, so that the center of the needle describes the triangle indicated by the dotted lines *o o o*. When the cam *C* rotates in either direction, the block *N* is moved one-half the speed of the cam, so that the shaft and cam together make two revolutions to one circuit of the block *N*, and whatever the latter carries. Observe that by means of the cam *C* the block *N* is moved into and out of the points of the internal triangle easily. Some of the diagrams Mr. Allen published last week are nearly, if not quite, outside of the limit of possibility of moving the block out of the corners or points of the triangle by means shown. The moving parts of the inclosed solution are (1) cam and shaft, (2) block and needle having roll in rear fitted to cam, = 2 moving parts. Observe that I have drawn cam parts only approximately, and have not stopped to fully develop exact form, as if cut correctly for use."

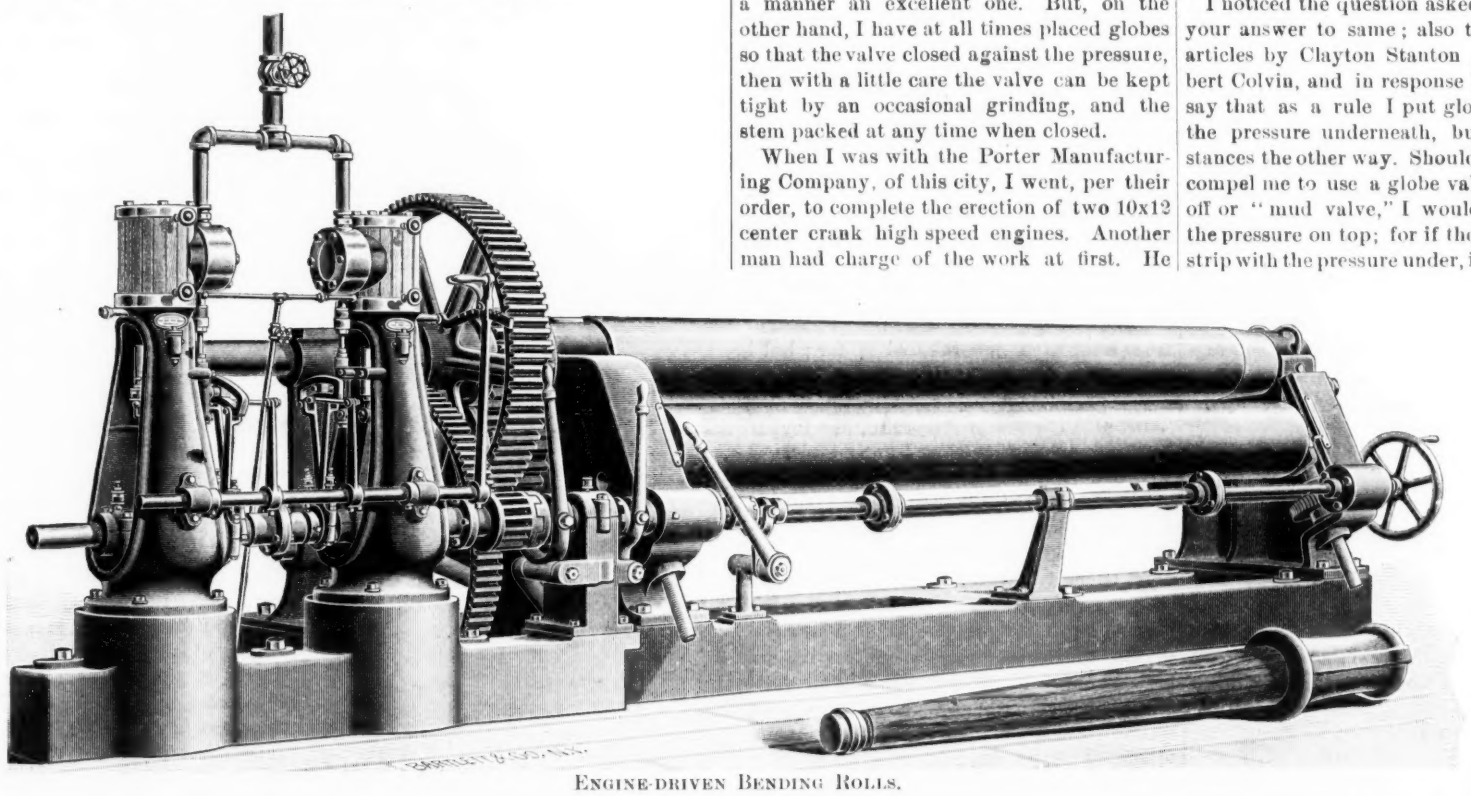
Mr. A. Marlor, of Houghton, Mich., has solved the problem in a manner analogous to that shown in Mr. Clough's second solution; that is to say, he uses a three-lobed cam groove, making it stationary, connects a friction roller running in this groove with a hexagonal needle block by means of a link passing through and sliding in a rotating crosshead attached to a shaft turning in the geometrical center of the triangle, but in this movement the slide makes a complete circuit at each rotation of the driving shaft.

A considerable number of solutions yet remain to be noticed.

With reference to the solution of the first problem, as given by Mr. Slocomb, of Providence, R. I., he has added to what was stated in explanation of the movement, referring to the illustration (issue of March 17), that "the real purpose of the arrangement was to produce a shorter period of rest than the time required by a link of the chain in rounding the wheel. In the position shown of the lower lug *E*, the bell crank pawl *D* has just disengaged from the lug link directly over it. Now it will be seen that a lug link is just engaging with the bell crank pawl at the top, so that, instead of the slide remaining at rest till the lug link, which has just disengaged with lower lug on the slide, has made the half revolution of the wheel, the slide starts directly back almost at the same time the lower link disengages.

"Now as to the purpose of the spring *G*, and the special arrangement of the lug links, it will be readily seen that, if instead of the arrangement shown, there were solid lugs projecting from the chain, and the lugs attached to the slide were only solid blocks, then the slide, in going back, would bring the lower lug in contact with a lug link on the chain, and so all motion would be stopped; but, with the arrangement shown, the spring *G* throws the pawl out of reach of the chain when disengaging, so there is no position in which there can be an engagement except the extremes of travel of the slide, as shown at the top of the diagram."

It will repay students of these problems to refer back to the illustration and carefully follow out Mr. Slocomb's analysis of the movement above quoted.



ENGINE-DRIVEN BENDING ROLLS.

Engine-driven Bending Rolls.

The accompanying illustration is of a set of bending rolls intended for bending plates of iron or steel up to ¾" thick, and any width up to 14 feet. The cut gives a rear view of the machine, that being the side from which the arrangement of the mechanism is best seen. The machine is in some respects similar to one previously illustrated by us, made by the same builders, but is modified to receive a pair of reversing engines by which the rolls are driven. This plan of having rolls driven by independent engines has, of course, its advantages, among which are the ability to control the speed, to readily reverse the motion; there are no belts to slip on heavy work, but the power is always ample and also always available, without interference with the power that drives the rest of the establishment.

In this machine the initial rolls are placed one directly over the other and both are driven, thus pinching the sheet at the start and carrying it through at a uniform rate, without the possibility of slipping, which, of course, is a point of importance, especially in bending light plates.

The bending roll is placed at the back, and is moved in the housings by power, to adjust it to the curvature of the sheet being bent. By power both ends of this roll are moved together, but either can be adjusted independently by hand when it is desirable. The rolls are 12" to 14" diameter, according to the width and thickness of the plate to be bent, and, to facilitate the removal of rings or flues which have been bent to a complete circle, the outer bearing for the upper roll is arranged to be thrown back, leaving the end of the roll free for the removal of the work.

Suitable indicators are provided to facilitate setting to any desired radius of curvature, and the workman controls all movements of the machine and engines from one position, suitable levers and clutches being arranged for that purpose.

It will be seen that the machine is substantially proportioned, that it rests upon a heavy bed-plate, making it entirely self contained, and so in a measure independent of its foundation, and that it is powerfully geared. The builders are the Niles Tool Works, Hamilton, Ohio.

LETTERS FROM PRACTICAL MEN.

Prefers the Pressure on the Under Side of Valve—Stop Valves Between Engine and Dome.

Editor American Machinist:

Will you kindly permit me space in your valued paper to say a word about globe valves? You have related why you prefer the steam pressure on back of valve. I, too, think your reason for placing valve in such a manner an excellent one. But, on the other hand, I have at all times placed globes so that the valve closed against the pressure, then with a little care the valve can be kept tight by an occasional grinding, and the stem packed at any time when closed.

When I was with the Porter Manufacturing Company, of this city, I went, per their order, to complete the erection of two 10x12 center crank high speed engines. Another man had charge of the work at first. He had the valves placed as you advocate, and the stems were leaking a good share of the time, as pressure was kept at 130 pounds gauge, and with the shallow stuffing boxes without glands it was not an easy matter to keep them tight. I was appointed to remain in charge of the engines until accepted. One morning at one o'clock, I, with the others, heard a loud clack; the engine stopped, and not only the station, but the city was in total darkness. I contend that, had the valve been made up so as to close against pressure, the engine would have remained in motion. I took each valve out and pinned it with a screw. This kept the disk inclosed within the fine nut.

I have found many boilers with no stop valve between throttle and dome; this is a serious wrong. All boilers should have a stop valve next to dome. GEO. N. FINLEY.

A Puzzling Order.

Editor American Machinist:

The concern with which the writer is connected recently received an order for some goods to be sent to a foreign country, which, among other things, called for: "One piece wrought-steel with elbow to produce the rotary movement of the oscillation of the piston in the engine (Pitman's)."

There was considerable speculation as to what was really wanted, but our chief engineer, who, by the way, can tell a crank even in disguise, ventured the opinion that a crank-shaft was wanted; and sure enough a few days later a wooden model of a 7x10 engine crank-shaft arrived, turned exact to size, rubbed down, polished and finished in oil.

We allowed that enough energy had been expended on that order and model to produce a steel shaft from the ore.

W. G. S.

Cutting Bevel Gears with Spur Gear Cutters.

Editor American Machinist:

Mr. "Easy Way," in your issue of March 17, advocates a full discussion of the above subject, yet he himself contributes nothing to the general fund of knowledge except in regard to sizing the blank. As to setting "index spindle to angle of bottom of tooth," that follows as a matter of course in any method of cutting either bevel or spur gears. How else could it be set? Neither does he say anything of the results of his labors, whether they were good, bad or indifferent, nor of any difficulties he may have encountered. If E. W. wishes any discussion, why doesn't he ventilate his own experience a little more fully, by way of example?

WALTER GRIBBEN.

Putting in Globe Valves.

Editor American Machinist:

I noticed the question asked by O. S., and your answer to same; also the subsequent articles by Clayton Stanton and Fred Herbert Colvin, and in response I would like to say that as a rule I put globe valves with the pressure underneath, but in some instances the other way. Should circumstances compel me to use a globe valve for a blow-off or "mud valve," I would place it with the pressure on top; for if the thread should strip with the pressure under, it would be likely to blow the boiler dry. I have known this to happen and very seriously injure the boiler.

I also want to call your attention to an error in your answer to O. S. You stated that the pressure should be on top for safety. By reflection you can realize with a battery of boilers with globe valves, for stop valves, all put in with pressure on top, when you cut out and cooled a boiler down the pressure would be reversed and be under the valve, making a dangerous arrangement. I consider that placing globe valve next to steam domes, as Clayton Stanton mentioned, represents very poor practice. There should be a stop valve, but it should by all means be a gate, which has the following advantages over globes: first, safety, on account of non-liability to strip the stem threads; second, the construction allows packing under pressure; third, it is a straight way and gives a free passage to steam. A TEXAS SAW-MILL ENGINEER.

Wants Information About Punching Small Holes.

Editor American Machinist:

In your issue of April 7th, Mr. W. R. Macdonald speaks of a device which he found in use at Toledo, O., by means of which ⅛" holes could be punched through ⅜" steel tires. This is certainly a very extraordinary and interesting performance, more particularly in view of the inexpensive tools which seem to have been employed. The writer would be much interested to know the construction and exact dimensions of the chuck and punches used; also the speed at which the punching was done, etc. If Mr. Macdonald could supply exact information on these points he would render

many of your readers a considerable service.

The difficulties in the way of (commercially) punching holes so small through metal so thick have been considered well-nigh insuperable by manufacturers generally.

A. W.

That Caliper.

Editor American Machinist:

The caliper sketched by J. R., page 6, of your issue of April 7 will give varying readings of the diameter of a piece, according to the degree of opening of the *main* legs, as the extra toe is thrown out of a line drawn between the two main toes, and with one degree of opening of the latter will measure a diameter, and with another a chord. In any case touch is more delicate than sight, particularly where there must be either spring or lost motion. G.

Truing an Emery Wheel.

Editor American Machinist:

Fred Colvin, in his last letter, mentions a case of truing an emery wheel with gas pipe.

I recently had occasion to use a fine wheel 6″ diameter, ⅝ face; it was out of true, and as we have no "dresser" I dug the "stub end" of a coarser wheel out of the scrap, and found, by holding it on the rest and revolving it slowly, I could true it nicely. This may be of interest to some other fellow who has to make the most of what the scrap heap contains. Repairs.

A Scheme for Backing Off Dies.

Editor American Machinist:

One by one the old file methods are being replaced by machine work, and these things are not altogether confined to the factory; but once in a while we hear of something new that will apply to the work in a common machine shop. A friend of mine invented a scheme for cutting the clearance on the cutting edge of dies for screw cutting, which is so simple, and does its work so well and quickly, that I use it instead of a file, even if I have only one to do.

I show in the sketch inclosed a plan for using this scheme, which would be much better than anything I ever used. Suppose *H* is the face-plate of lathe, that *K* is a special holder, bored to fit the outside of die, and set eccentric on lathe face-plate. *M* is the die itself, which is held in the holder by the set-screw *E*.

Before "backing off," the die should be chamfered inside as in the usual way. Set the face-plate so the die shall be at its lowest part of throw, as shown, and make a mark at top side of face-plate, as shown at arrow-head *D*.

With a proper tool set about as shown, bring the edge of die *B* to correspond with tool as shown, and make fast with set-screw *E*.

Now the die is in proper position to be cut to line *C*. A few strokes back and forth of face-plate by hand will finish one flute, then slack on set-screw, turn face-plate till arrow head stands at the top as before, turn die in holder till the next cutting edge corresponds with tool as before, and so for all.

I have only used a common chuck to hold the die in, and in changing its position slack two jaws, leaving the two opposite jaws fixed.

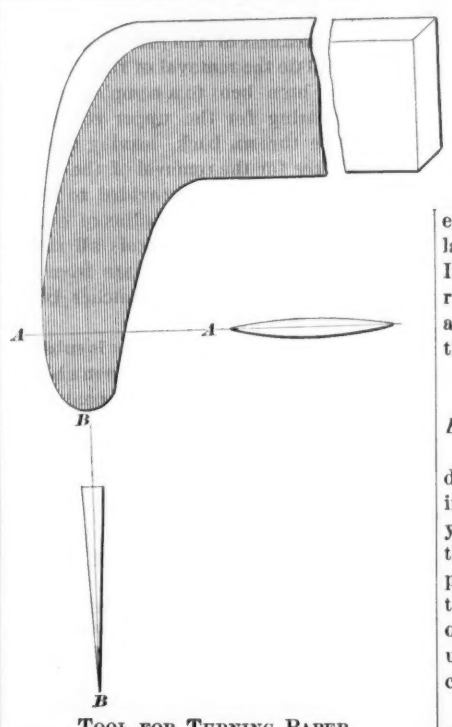
I have shown this die set off center too much, for the purpose of making the idea more plain. I find the proper amount to set the die off center by experiment; there may be a better way, but I think this is good enough. A Mechanic.

Perspective Drawing.

Editor American Machinist:

The drawing board addition for perspective drawings suggested by Mr. Pentz in your issue of March 31 is pretty old. I learned its use in Chicago in 1872, from the well known architect's artist, Mr. Bolin Stark, a Russian artist of great skill, for whom I worked a short time as a student of his art. I do not know whether he was the inventor of that admirable device, but from his modesty I have always been of the impression that it was older than he at the time. At the time I speak of, Mr. Stark was making a very large perspective drawing of either the Pacific or the Tremont Hotel, and he observed to me that, if he had to use a straight-edge, he would have to rent another office across the street.

Francis Leclere.

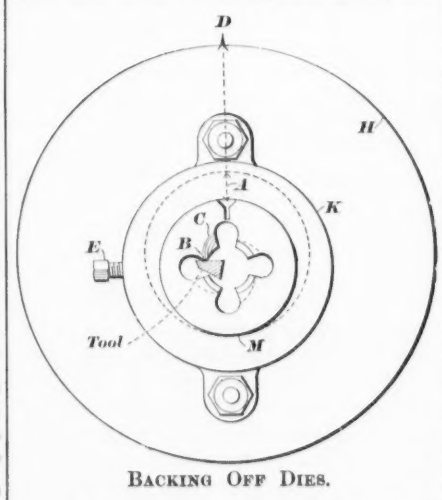


Tool for Turning Paper.

Tool for Turning Paper.

Editor American Machinist:

In Question 102 J. H. S. asks for the best kind of a tool for turning paper, and amongst Letters from Practical Men in yours of March 31st, F. S. answers that "most any kind of a tool will turn paper." That may be true to a certain extent, but I do not think that answers the question of J. H. S., although I do not know what kind of paper or what kind of a job the tool is for; but I will presume that the tool is for ordinary paper or friction paper made up in the shape of a friction or something like that to be turned in a lathe. Now I know that most any kind of a tool such as a diamond point or broad, round nose are not the best for such paper turning. We all know that certain shaped tools for different jobs and materials must be used to reach the best results. I inclose a very poor sketch of a tool that has given perfect satisfaction where I am employed for thirteen years or more. We use nothing else on paper frictions of all sizes; we have turned them as large as 60″x24″, and down to 2″x16″; there are a good many to turn here, as this part of the country is full of saw-mills, and they are full of iron and paper frictions. If we did not have this kind of a tool I do not see what would become of us; we would stick in the mud on paper frictions surely. The tool makes a straight and smooth job when it is properly used, but it requires a little judgment to use it. It can be made of tool steel the proper size for the lathe that it is to be used in, the cutting end to be drawn down quite thin with both edges and point, thin enough for grinding to a cutting edge; use oil stone after grinding. The temper can be very hard, as the paper wears the edge very fast, so as to make the tool dull, although the speed may not be much faster than for cast-iron; for internal frictions tool can be straight, but for outside cutting it must be bent over to about a right angle. In turning or cutting taper frictions start at small end and go up hill. Set tool so there is not too much clearance back of cutting point, as it is liable to go in deeper than wanted, especially if rest happens to be slack. The lathe feed may be applied in most cases. In short, it is the same principle as cutting rubber; it can be cut with the same tool, but as rubber is generally smaller in diameter the tool must be narrow. Steam Feed.



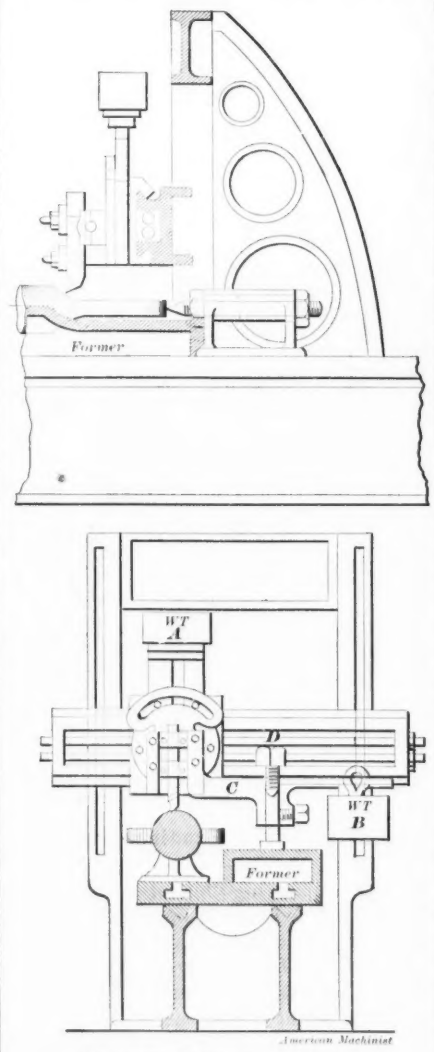
Backing Off Dies.

Planing Irregular Forms.

Editor American Machinist:

"A Mechanic," in your issue of Feb. 18th, describes a plan he used for irregular planing, so I thought it might be of interest to your readers to see another plan I used for the same purpose, but which can be used to produce a greater variety of forms. Curves that lie in the former, on either the vertical or horizontal planes, would be duplicated upon the work, while the former device is confined to curves on the vertical plane.

In the illustration, the work is shown mounted upon centers, so that the rod may be turned round, and so be able to plane both sides with the same setting and true to center. In cutting a down curve, as well as an up curve, I found it was necessary to balance the weight or pressure of the shoe on the former, and so relieve the friction on the sliding head in the saddle by extending the arm of bracket and hanging a weight at *B*. The bracket *C* was bolted in the tapped holes that held the cap of apron, but where there is no cap, may be bolted as shown by "A Mechanic." The set-screw *D* provides for the adjustment of the cut, as will be seen by the sketch. I. W.



Planing Irregular Forms.

Gate vs. Globe Valves.

Editor American Machinist:

While the points on both sides of the question as to which way to place a globe valve, with or against the pressure, have been well taken, the writer's belief, after an experience of over twenty years, is that it is best to avoid them altogether and use gate or straight-way valves on sizes over one inch diameter This applies to both steam and water piping. While the first cost may be slightly in advance of the best globe valves, the increased service of the gate makes them much the cheaper in the end; as an instance, I would cite the case of a 3″ throttling gate valve on an engine that has been used at least four times a day for over eighteen years without repairs, and is still tight. There is far less danger of injury to seats with them than with globes, not only from any foreign matter, but from the action of the steam itself.

The use of gates of larger sizes necessitates the use of a by-pass pipe, but globes of same sizes opening against the pressure should also be provided with similar pipes, so that cannot be used as a point against them. In fact, the use of a by-pass pipe often prevents serious accidents, a case in point coming to my notice only a few weeks ago. The engineer in charge of a cable road power house, coming in a little late one morning, opened an 8″ valve on boiler to steam run of engine so suddenly that the expansion of the pipe caused an elbow to burst, a piece of which struck him, causing almost instant death. While this was an extreme case, owing to the fact of its being an exceptionally cold morning, still it would not have happened had there been the smaller pipe leading around the valve, the valve on which could have been opened to warm up the pipe and equalize the pressure.

It requires far less pressure on hand-wheel to seat the valve than on a globe, consequently there is less strain on the stem, which, outside of the fact of increasing the life of the valve, also makes it a pleasanter valve for the engineer to handle; and it is well to keep him good-natured, as a rule. All experienced men know that it is not the use, but the abuse that valves receive that knocks them out so soon, such as 18″ monkey-wrenches hooked on to the rim of hand-wheel to open or "close her down tight," or leaving them just open, causing wire-drawing, or "socking it to her," if she sticks or leaks, instead of repairing up at once. The valve manufacturer suffers for these performances, and his goods, which, with care, would last for years, are condemned by the "hustling" engineer. I have always noticed that the two things most abused in the shop are the valves and the monkey-wrenches, and I guess they always will be, talking pleasantly or otherwise seeming to have no effect on the average user.

One of the best packings for the stems of valves, of sizes say up to two inches, can be made of the odds and ends of Jenkins, Usudarian or any other similar packing of a thickness of $\frac{1}{16}$″ or $\frac{1}{8}$″. In cutting out gaskets from such material there is more or less waste, which can best be utilized by cutting up into strips varying in width to suit the stuffing box. These strips can best be cut by taking a bradawl and sticking it into a board; then stick a knife-blade into the board about one-eighth of an inch from the awl; take circular piece of the waste packing and cut strip on the edge long enough to get hold of, then draw the strip through between awl and blade, letting circle revolve, but holding it down flat on board. This packing will last for months on very high steam, but gland must be tightened up very gradually on the start, owing to its expansive and also expensive nature.

"Granger."

To Clean Emery Wheels—Information Wanted.

Editor American Machinist:

I have a flexible shaft used in cleaning zinc dies.

The emery wheels that I have tried become clogged by the metal, and I have resorted to the use of a buff wheel, which does the work very well, but the emery wears off very fast, and that necessitates re covering very often.

Can you inform me of any way that I can improve on my present mode of operation? If there is a wheel made that will grind zinc, I will be obliged if you will inform me where it can be procured, or any suggestions from you or any of the readers of the American Machinist will be thankfully received. B.

A Trolley Cross-over.

Editor American Machinist:

Inclosed please find blue-print of a device for crossings in overhead traveler which I have just put in operation in our bridge shop.

The upper traveler moves longitudinally, and the lower one transversely, and they are for conveying the iron from the punches to the riveting machines. It gives perfect satisfaction.

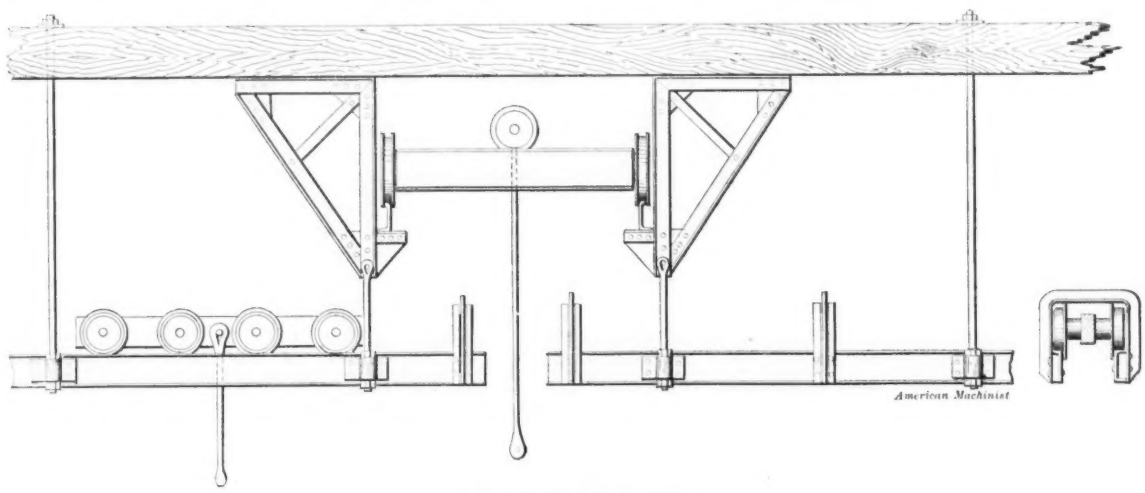
It puzzled me for some time as to how I was going to pass the longitudinal travelers until this idea of the eight-wheeled trolley presented itself. The distance between the centers of the wheels is greater than the open space, hence the lap. The load is never on less than three pairs of wheels when crossing over.

Its simplicity is its beauty.

I read your paper every week, and thought this might be of some use to you, and trust it will be acceptable.

A. T. NICHOLS,
Superintendent the Pittsburgh Bridge Co.

[Mr. Nichols' blue-print and letter tell the story. Elaborate devices are in use for accomplishing what this simple device does in a safer, more reliable and altogether better manner.—ED.]



A TROLLEY CROSS-OVER.

The Patent Office.

Editor American Machinist:

Your paragraph, "The Patent Office," gives me pleasure. It is in a line I have endeavored to work these many years—I am sorry to say without much success—and it seems to me a curious thing that men who are interested in patents, and in many cases dependent on them, are still apathetic in matters relating to the patent office, the fountain of whatever value patents have. You are in error as to the profit to the government from the earnings of the patent office. The surplus goes to the credit of the patent fund, from which no money has ever been appropriated except for the use of the patent office. This sum is now a large one, and notwithstanding this fund has been accumulating at the rate of about $100,000 per year and yearly there have been urgent calls from the department and from the newspaper press that some of this money should be spent for improved facilities in the patent office; Congress as regularly ignores such calls. It would not be so if every patentee and owner of patents would write to his congressman. Apathy in Congress is solely because of apathy at home; calls from the commissioner do not affect any votes, and do not excite any attention.

The patent office building was erected with money paid by patentees in excess of the cost of business done for them. The Secretary of the Interior took possession, and for many years his whole department was housed there. The Agricultural Department, in which some millions of farmers felt an interest because it sent them yearly installments of poor seeds and big reports, and because members of Congress were remembered in the distribution of flowers and hothouse grapes, had no trouble in being set on its own bottom, notwithstanding its Quaker commissioner thought the importation of a hydraulic ram would result in a new breed of sheep. Later, its head has been made a cabinet officer. The usefulness of this department to the people may be weighed in ounces, while that of the patent office would be indicated in tons. If patentees would be equally aggressive, something would come of it. In the meanwhile write to your congressman, and do it right away.

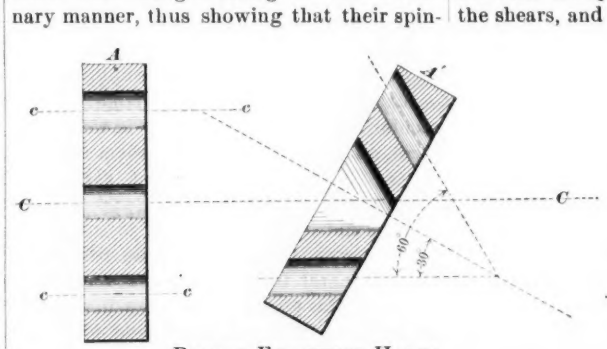
R. D. O. SMITH.

Boring Eccentric Holes.

Editor American Machinist:

In the issue of March 10 "A Mechanic" contributes a description of a device for boring eccentric holes, of which he says that with its use "we are sure of the holes being parallel with each other."

I hope I may be pardoned for calling attention to the fact that this depends upon whether or not the lathe spindle is in line with the shears, and there are so very many lathes that will not bore exactly cylindrical holes when using a boring tool in the ordinary manner, thus showing that their spindles are out of line with their shears, that it seems to me it may be useful to call attention to an error into which those who rely upon the plan too implicitly may fall.



BORING ECCENTRIC HOLES.

In the sketch I have shown a horizontal section of a piece of work *A*, which is supposed to be mounted upon the face-plate of a lathe, the center line of this lathe being represented by the line *C C*. In this case the spindle is supposed to be in line with the shears, and the hole in the center of *A*, being bored with the tool in the ordinary way, will be cylindrical; *i. e.*, the same diameter from end to end. The holes bored near the edge by the device under discussion will have their center lines *c c* and *c c* parallel with that of the hole in the center, which means that all the holes will be parallel each one with the others.

But now consider the case of the piece *A'* which is supposed to be mounted upon a lathe face-plate with the spindle out of line with the shears 30°, as shown. Now the hole bored at the center will be conical, as shown, and its center line will be parallel, not with the shears, but with the spindle of the lathe. On the other hand the holes bored by the revolving boring bar, which travels forward in line with the shears, will, of course, have their center lines parallel, not with the spindle of the lathe, but with the shears, and the result will be as shown, the angle between two holes diametrically opposite each other being twice the angle between the spindle and shears, or in this case 60°.

T. A. PANDIE.

Thickness of Cylinders.

Editor American Machinist:

The formulas for thick cast-iron cylinders, exposed to bursting strains, given in answer to A. B. (475), 1891, vary very widely from good practice. An 8″ cylinder 3″ thick should carry safely 2,500 to 3,000 pounds in regular continuous work if three diameters long, and 3,000 to 4,000 pounds if only about one diameter long.

A formula that does not take into account the increased strength due to the bottom of the cylinder, and the metal above the packing, in short cylinders, ignores a very important element. Above three diameters long cylinders will rupture midway of the length before the resistance of the ends comes into play. Taking cases actually in use, and applying the formula for thickness, it is necessary to make $S = 9{,}000$ to $14{,}000$ pounds to have the theory correspond with the facts. It is not likely that cast-iron cylinders would stand long if exposed to any such strains. It appears to be impossible, if this formula is correct, to construct a cylinder so that the strain on the metal would not exceed the pressure, for if $S = p$ we have $t = \frac{p\,r}{o} = \infty$. If $S = p + 1$ we have $t = p\,r$. If $S = p + 2$ we have $t = \frac{p\,r}{2}$. It does not seem probable that reducing the pressure one pound would reduce the thickness required by one-half.

A good practical rule is to make the thickness equal to $\frac{1}{10}$ of the inner circumference, and ample experience has shown that such proportions will stand for years under 3,000 to 4,000 pounds pressure. Furthermore, nothing is to be gained by making the thickness more than three-eighths of the inner diameter. Of course this does not apply to cylinders made by some special process, such as water cores, etc., but only to such as are made by good ordinary foundry methods.

SUPERANNUATED.

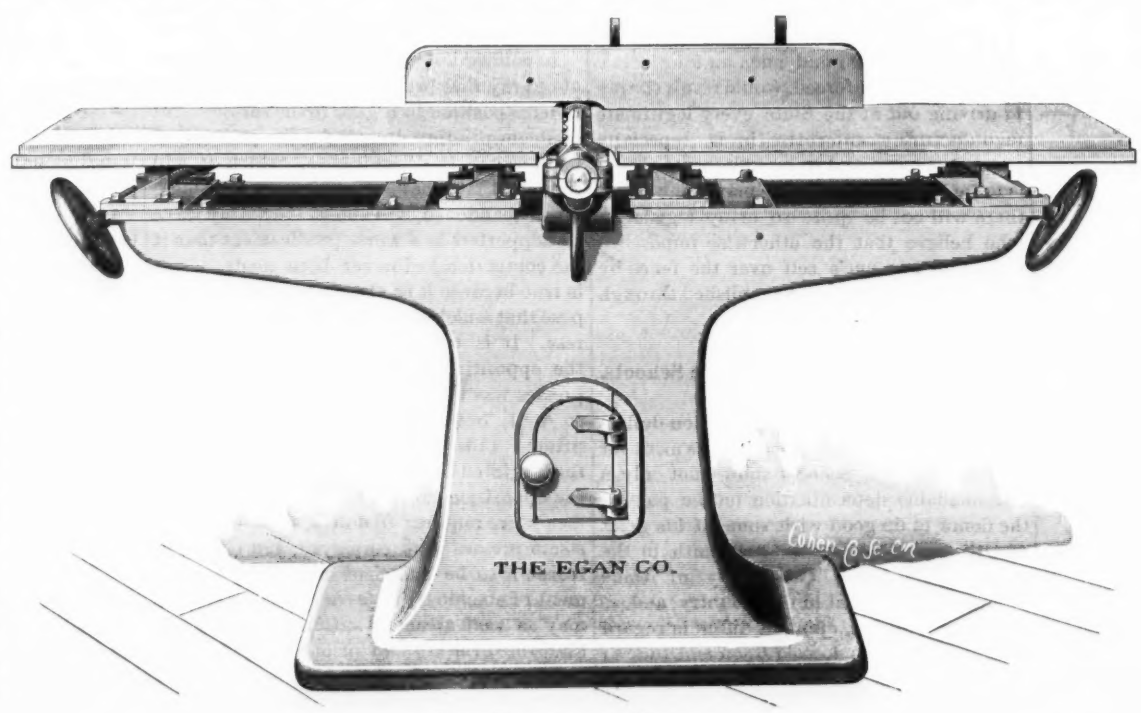
Buzz Planer and Jointer.

We illustrate herewith a newly designed machine, intended to dress and take out of wind pieces of lumber up to 24″. As the cut shows, the machine consists essentially of a hollow frame cast in one piece, upon which are mounted two tables which are adjustable vertically and independently by means of the hand-wheels seen at either end of the machine, these tables being supported upon the usual inclines as shown, these inclines being so arranged as to keep the throat always as small as possible. Either table can be moved entirely away from the head for convenience in setting or whetting the knives. Tables are extra long—over 6 feet out to out.

The boxes for the head are supported upon the center of the main frame, at which point it is ribbed and braced especially for their reception to make the support as rigid as possible. The head is of steel, with ample bearings which are self-oiling and babbitted. The head is tested by the makers at 6,000 revolutions per minute.

The fence is designed with a view to convenience and simplicity, can be set to any desired bevel on any part of the table, or can be quickly removed when not wanted.

For rabbeting, jointing, smoothing, chamfering and other operations in cabinet, chair, coffin and frame factories, pattern shops, planing mills, etc., the machine will be found useful. It is built by the Egan Co., Cincinnati, Ohio.



BUZZ PLANER AND JOINTER.

A new car ventilator has been devised by W. S. Rogers, and it was tested on the Delaware & Hudson road, keeping the air of a smoking car clear. We wonder if there were any cigarettes in that car? If not then the crucial test is yet to come.

The *Practical Mechanic*, of Worcester, has been discontinued, and will be merged into the *Worcester Commercial and Board of Trade Bulletin.*

It is said that a petrified ham has been found in Indiana, and it is believed this will be of special interest to the keepers of railroad restaurants.

AMERICAN MACHINIST

Communications relating to the reading columns should be addressed to the Editor. All other communications should be addressed:

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J. G. A. MEYER, } Associates.
FRED J. MILLER, }

Special Announcements.

☞ *Positively we will neither publish anything in our reading columns for pay or in consideration of advertising patronage. Those who wish to recommend their wares to our readers can do so as fully as they choose in our advertising columns, but our editorial opinions are not for sale. We give no premiums to secure either subscribers or advertisers.*

☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draftsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once. Date on wrapper denotes week with which subscription expires.*

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$3.00 a year in advance, postage prepaid, in the United States, Canada, and Mexico.
$4.00 a year to Other Countries, postage prepaid.

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The International News Company,
BREAM'S BLDG'S, Chancery Lane, LONDON, E. C., ENG., or Stefanstrasse 18, LEIPZIG, GERMANY, will receive subscriptions for the AMERICAN MACHINIST, at 16/6 per annum, English currency, or 17 marks per annum, German currency, postpaid.

Subscriptions received in Paris, France, by E. TERQUEM, 31 Boulevard Hausmann, at 20 francs per annum, postpaid.

Subscriptions received in Australia by W. WILLIAMS, 17 and 21 Fink's Buildings, Melbourne,

NEW YORK, APRIL 21, 1892

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Change of Location.

On May 1st, the AMERICAN MACHINIST offices will be moved about two blocks west from their present location to the new *Mail and Express* building, which fronts on Broadway, at No. 203, and on Fulton street, numbers 164–8. We shall then have increased room and better conveniences and facilities for carrying on our work.

Taxation of Manufactures.

Maryland manufacturers are likely to be very much interested in a law just passed there, which is intended to make personal property pay a larger share of taxes than heretofore. This law is so framed that the president of an incorporated manufacturing company, for instance, will have to make a sworn statement of all his personal property, including money, stocks, bonds and securities of every kind representing investment, including also mortgage bonds of incorporated companies. In addition to this he must make a statement for the company which he represents, which statement must include all its possessions. The president personally must pay taxes upon the shares of stock he holds, and upon the mortgage bonds of the company held by him, if any.

Practically the same property is then taxed over again in the form of a tax which is levied upon the property of the company, for this property is, of course, that which has been purchased by the proceeds of its stock shares or mortgage bonds; and in addition to this the company is again taxed upon its income, which makes three taxes upon the same property, and these taxes must all be represented in the cost of the goods produced. This it would be thought would be sufficient to cause Baltimore to greatly decline as a manufacturing city and, of course, its ultimate effect would be to discourage manufacturing and all other kinds of effort calculated to build up cities and other communities.

The fact is, however, that no such law can be enforced. Those who are unscrupulous will evade it on principle, or rather for the lack of it, which they can easily do as a general thing, while those who have conscientious scruples will be obliged to suppress them and follow the example of the others in pure self-defense, the main effect of such a law being to lower moral tone—in short, to increase lying and perjury.

There may be here and there in the State a manufacturing corporation which can stand such a burden of taxation, but they are very rare, as any one may know who is at all acquainted with manufacturing business as now carried on; and such an idiotic law as this, strictly enforced, would result simply in driving out of the State every legitimate manufacturing enterprise in it, especially those that happened to be incorporated. It is to be hoped that the day may come when there will not be quite so many legislators who believe that the otherwise impossible feat of lifting one's self over the fence by the boot-straps can be accomplished through taxation.

Mr. Morgan's Gift to the Trade Schools.

The recent gift of a half million dollars by J. Pierpont Morgan as an endowment for New York Trade Schools shows not only a commendable determination on the part of the donor to do good with some of his great wealth, but it shows as well faith in the means employed. The utility of trade schools is yet on trial in this country, and, as might be expected, opinions differ in regard to them. They are looked upon and judged by three classes: First, those who are opposed to them because of a belief that they will permanently reduce wages in the trades that it is proposed to teach in such schools; second, those who have no hesitancy in saying that by their aid the power of trades unions may be broken, and, third, those who feel no particular enthusiasm or interest one way or the other, but are nevertheless watching the course of such schools as they would watch anything about which more or less stir is being made. The judgment of this last class is likely to be the best, because practically unprejudiced.

Regarding the opinions of the class first named, it is hardly possible for these schools to have any perceptible effect in reducing wages for a long time to come. The number graduated will be too small for this; besides, before these graduates can compete with skilled workmen in the trades they must spend considerable time in actual work pertaining to these trades. Furthermore, the young men who have spent considerable time and some money at trade schools, and have passed through a further period of learning in the outside world of regular work, are not likely to set less value on their services than those who come by their knowledge in other ways.

As to those who hope to break or seriously cripple the power of trades unions through the competition of trade school graduates, before that can be hoped for, if ever, there may be such changes that workingmen will abandon these unions as not necessary, or not suited to the times. If this is not so, there is little reason to believe that men who learned the rudiments of their trades at schools will not combine to keep up wages, or for other purposes.

As before said, trade schools are yet in a probationary state. Such gifts as this of Mr. Morgan, for which he deserves great credit, will help in solving the question of the measure of their usefulness.

A Useless Opposition.

Some time since we referred to the employment of canceling machines in post-offices as one of the coming employments for machinery in place of hand labor. Such machines have been put in now in the large offices, and soon a hundred of them will be in use. They are capable of canceling about 30,000 letters per hour, and a still greater number of postal cards.

We suppose there will be those who will honestly regret to see these machines employed for this purpose, believing that their effect will be injurious, by reason of their throwing men out of work. But is canceling letters work that sentient human beings ought to be satisfied to do? And will not the relief from all such work eventually be well for the human race? Our answer to these questions would be an affirmative one. Others' answers might be negative, but there can certainly be no difference of opinion regarding the superiority of the work done by the machines. The date of the stamping can be read, which is more than can be said for much of the hand stamping.

In connection with this it seems appropriate to say that organized labor seems to have taken a position in regard to the employment of steam printing presses for the printing of bank notes in Washington, which it will sooner or later have to abandon, and which, when abandoned, will almost inevitably leave its supporters in a worse predicament than if the contention had never been made. This is true because it is always a mistake to oppose that which obviously tends toward progress. It is true that the reason given for the opposition to the employment of steam presses was that they did not print the bills so well; but tests showed that the steam-printed bills were indistinguishable from those printed by hand, and no one doubts that the opposition came from the fact that less men were required to do the work when the steam presses were employed, and if such a reason is to be sufficient for the abandonment of machinery in favor of hand-work we may as well abandon steam presses for all kinds of printing and print everything by hand presses, as Franklin did. No machinist who prefers to use the slide rest rather than hand tools can consistently oppose the use of any labor-saving device whatever.

But another circumstance to be noted in this connection is, that not all the opposition to new and improved ways of doing things comes from those who fear they may be thrown out of work by them.

A member of the Philadelphia city council —a city which prides itself upon its machine shops and its mechanical productions generally—has introduced an ordinance the object of which is to restrict the use of bicycles upon the streets of that town. He declares that the use of these machines on the streets of that city is a nuisance; and this is nothing more than an unreasonable opposition to new ways of doing things, to doing things by machinery that have previously been done by unaided muscles.

Block Signals.

A lady who was a passenger, frightfully injured in the Hastings collision, on the New York Central road, has sued that company for $250,000, she having lost, as a result of the accident, both eyes, both hands and both ears, besides being otherwise severely injured by burning. The cash which will in all probability be required to settle this suit, together with the others which will be brought, would go very far towards paying for a complete system of interlocking block signals and switches, and such a system is now being put in on the road as fast as possible, the doubt regarding the existence of a practical system formerly entertained by the Central officials having in some way suddenly been dissipated. By the way, we often wonder what those editors now find to say regarding the matter, who, immediately after the accident, appeared to think it their duty to defend the road, and chose to do so by maintaining that the officials of the road knew best what it required to make it safe, and that block signals could not be applied to it, or, if applied, would only increase the danger of collisions? Will they be consistent, and declare that the road is more dangerous afterthe signals have been completed than before? They cannot claim that a new or better system has been devised especially to fit this case, for the systems to be used are such as have been in regular use on other roads.

Meantime the Pennsylvania Company is making a prominent feature in all its advertisements, the fact that its road is thoroughly protected by block signals, and such advertising will inevitably have its effect; the time is coming when all roads that wish to do much passenger business must be able to so advertise.

Literary Notes.

PRACTICAL CARRIAGE BUILDING: Comprising Numerous Short Practical Articles upon Carriage and Wagon Woodwork; Plans for Factories; Shop and Bench Tools; Convenient Appliances for Repair Work; Methods of Working; Peculiarities of Bent Timber; Construction of Carriage Parts; Repairing Wheels; Forms of Tenons and Mortises, together with a variety of useful hints and suggestions to Wood-workers. Compiled by M. T. Richardson, editor of the "Blacksmith and Wheelwright," "Practical Blacksmithing," "Practical Horseshoeing," etc.

In this little book of 222 pages will be found valuable information of a thoroughly practical character, useful to carriage and wagon makers and blacksmiths. The contents of the book is a compilation of the methods of construction as expressed by workmen who have gained their knowledge from every-day experience, and the whole is given in the simplest language that will serve to make plain the object of the authors, and this, in connection with the many fine illustrations, places the different subjects before the reader in a very clear light.

Hints in regard to the kind of materials used are given, and the plans for a carriage shop are described; tools, floor, bench and wood-working appliances necessary for a successful shop receive their share of attention. A chapter is devoted to the description of methods of making wheels, and also gives useful and practical hints on repairing them. The last chapter treats on the forms of mortises and laps, carriage parts, swept front beds, shortening of bent beds, flaring seat corners, how to make a wooden axle, putting in axles and getting a plumb spoke, putting in wooden axletrees, and making a wagon run well.

This book is a valuable one for the young mechanic, and also for the older ones who have not had the opportunity to see how

others do the work. It is finely printed, fully illustrated, and bound in cloth. It is published by M. T. Richardson Co., Publishers, New York. Price, $1.

WHY BAND SAWS BREAK. Sixteen reasons—and how to avoid them. Being instructions to filers on the care of large band saw blades used in the cutting of lumber. By Joshua Oldham.

The author has been engaged for nearly twenty-five years in the manufacture of saws in New York City, and his experience has enabled him to bring out a book containing practical information which probably cannot be found elsewhere. The reasons for the breaking of saws are analyzed. The styles of hammers to use are illustrated, and instructions on hammering are given. The methods to be employed for removing improper and unequal tensions are explained. The remarks on the form of pulley as related to tension; space of teeth; width of band saws; and hints on brazing, convey information which should be possessed by all who are using band saws, and those who are interested in this class of machinery. The concluding portion of the book gives a short history on the manufacture and use of saws. The book contains 90 pages, is printed in bold type and bound in cloth. It is published by M. T. Richardson Co., New York. Price, $1.

QUESTIONS AND ANSWERS.

Questions of general interest relating to subjects discussed in our columns will receive attention in this department. The writer's name and address should always accompany the question. Neither correct initials nor location will be published when there is a request to that effect. If questions are enclosed with a business communication, they should be written on a separate sheet.

(158) R. C., Marlborough, Conn., writes: Please inform me if there is a book published treating on blow-pipe brazing. *A.*—We do not know of a book which treats on this subject alone.

(159) H. A. R., Philadelphia, Pa., writes: Please inform me how to lay out a pair of cone pulleys so as to have uniform changes of speed and equal tension of belt on all steps. *A.*—See our issue of December 1, page 2, 1888.

(160) A. S., Marseilles, Ill., writes: Please inform me what size of wire rope would be equivalent to a two-inch hemp rope. *A.*—A wire rope one inch in circumference will be equivalent to a hemp rope two inches in circumference. The breaking load of each is about 2,240 pounds.

(161) J. S. R., Belmont, N. Y., writes: Please give rules for finding the diameter of a coil, diameter of wire, of a close coiled steel spring, the load, length of spring and distance of extension being given. The springs are such as are used on shaft governors for automatic engines. *A.*—See answer to Question 486, November 5, 1891.

(162) J. D. Y., Boston, Mass., writes: Two shafts, each having a 15-inch pulley, are connected by belt. Can more power be transmitted by increasing the diameters of pulleys?—the width and tension of belt and speed of shafts to remain the same in each case. *A.*—Yes; for the simple reason that by increasing the diameter of the pulleys the speed of belt will also be increased.

(163) J. W. R., Philadelphia, Pa., writes: Please give me through your columns the simplest way of getting the number of revolutions of a machine without using the indicator. *A.*—We see no other way than to mark one of the revolving parts of the machine and counting the number of revolutions during any given time. In this manner you can count up to 300 revolutions per minute. If the machine runs faster than this you will have to use a counter or speed indicator.

(164) W. E. J., Birmingham, Ala., asks: What is the horse-power of an engine with cylinder 3 inches in diameter and 3½ inches stroke? What would be the dimensions of a boiler necessary to supply steam for the above engine? *A.*—With a boiler pressure of 80 pounds, and the engine running at a speed of 300 revolutions per minute, it will develop 1½ indicated horse-power. If the engine is to be used for manufacturing purposes, we should adopt a two-horse vertical boiler, such as is illustrated, and whose dimensions are given in our issue of March 27, 1890.

(165) G. S., Milan, Italy, writes: On several occasions it has been mentioned that caustic soda is very efficient for preventing scale in boilers. I should feel greatly obliged for information in regard to it. Does it damage or corrode the boiler plates? if not what should be the quantity used? *A.*—No damage will result if it is used with care. The usual quantity varies from ¼ pound to 2 pounds per day, according to the quality and quantity of the water evaporated. We should advise you to have the water analyzed, which may show that other chemical agents will answer your purpose better.

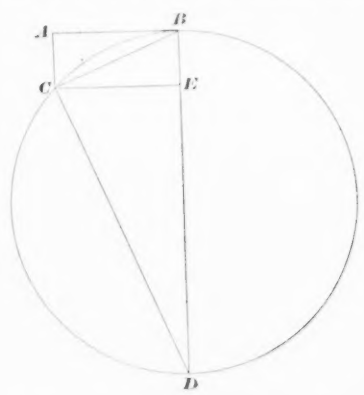
(166) R. M., Bologne, Italy, writes: I have a pump to make; the bottom of its air chamber over the delivery valve is cast solid, and limits the lift of the valve. Several holes will have to be drilled in the bottom of the air chamber so as to form a communication between it and the valve chamber. I desire to know the size of holes and the number required. The pump is to be used for feeding the boiler. *A.*—The holes may be from ⅛ to ¼ inch diameter; their aggregate area should not be less than 75 per cent. of the area of the delivery pipe. If the design of the pump will permit we should prefer to have these areas equal to each other.

(167) E. S., Newburgh, N. Y., writes: I am a machinist, and would like to obtain a situation in one of the navy yards at Brooklyn or Washington. Is it necessary to have any influence or pull? Kindly inform me through your columns what you think of it. *A.*—Mechanics are now appointed in the navy yards on their merit. Of course, those having influential friends will have an advantage over others who have none, in obtaining positions, either in private establishments or navy yards; but a political pull will not be of as great an aid as it used to be, if any. The Washington navy yard is now converted into an ordnance yard; engines or ships are not built there.

(168) E. C. S., Chicago, Ill., writes: Please give me the price of the book on Indicator Practice, by F. F. Hemenway, and where to procure it. Also price of articles on "Modern Locomotive Construction," by J. G. A. Meyer. *A.*—The price of "Indicator Practice, by F. F. Hemenway, is $2.00; it is published by John Wiley & Sons, 53 East Tenth street, New York. The articles on "Modern Locomotive Construction," 106 in number, can be sent from this office to any address for $5.30, or single copies at 5 cents each, postpaid. These will also be published at an early date in book form by John Wiley & Sons. All the other books and their prices to which you refer can be obtained from the dealer mentioned in your letter; write to him for a catalogue. We do not know whether you can buy these books in Chicago or not.

(169) J. L., Newark, N. J., asks: What would be the best dimensions for a small boat to carry 20 to 22 persons, the water being shallow in some parts of the river, varying in depth from 2 to 30 feet? Would twin paddle wheels on rear end of boat, connected to engine by bevel gears and shaft, work successfully? Could such a boat run seven miles an hour? What would be the horse-power of the engine, boiler, and size of wheels required for such a boat? *A.*—Length of boat, 28 feet; breadth, 5 feet; depth, 2½ feet; engine and boiler, about 4 horse power; diameter of cylinder, 3½ inches; stroke, 4 inches; number of revolutions, 400. We do not favor the use of paddle wheels and gears in this case. We should use one screw propeller 20 inches diameter, 36 inches pitch. With this boat you can make the desired speed. 2. Would a man have to obtain a government license to run such a boat? *A.*—Yes.

(170) S. A. H., Lehigh, Ind., writes: Please give rule for finding the diameter of a circle whose tangent $A\ B$, which is 12 feet, and the line $A\ C$, which is one inch long, being given. *A.*—Divide the square of $A\ B$ by the length $A\ C$; to this quotient add the



length of $A\ C$; the sum will be the diameter of the circle. Thus, the length of $A\ B$ being 144 inches, we have $\frac{144 \times 144}{1} + 1 = 20{,}737$ inches for the diameter of the circle. The foregoing rule is based on the following principles: Perpendicular to $A\ B$ draw the diameter $B\ D$, and through C draw $C\ E$ perpendicular to $B\ D$; then $B\ E = A\ C$; $C\ E = A\ B$; and $B\ C\ D$ will be a right-angled triangle. In geometry it is proved that $B\ E : C\ E :: C\ E : D\ E$; from which we get, $\frac{C\ E \times C\ E}{B\ E} = D\ E$; adding to this result the length of $B\ E$ we obtain the diameter.

(171) J. M. H., Cincinnati, O., writes: I have a kettle to melt lead in. It had to be made in two parts. The central part or plug has a pump fitted into it, and the plug wears out very fast. There is a space of about ⅛ inch between the plug and kettle which I would like to fill with some cement that will bake hard and keep the kettle from leaking. The castings are not planed, but are left in the same condition as found in the foundry. I tried white lead, but it burns up. Somebody told me to try sal-ammoniac, white lead and steel filings which would rust the castings together, but I made a poor success of it, and gave it up for a bad job. Do you know of some other receipt? *A.*—We should use litharge and red lead, equal parts, mixed thoroughly and made into paste with concentrated glycerine to the consistency of soft putty. This cement takes some little time to dry, but turns almost as hard as stone, and is fire and water proof.

(172) G. G., Allegheny, Pa., writes: Inclosed you will find a rough sketch of the steam valve for a Worthington steam pump, in regard to which there is an argument. A. claims that the two extra ports in cylinder are for the purpose of balancing the valve; B. says they are not for that purpose. We have concluded to leave the decision to you. Please answer the following questions. 1. Is the valve balanced by the extra ports, or is it not? *A.*—It is not. 2. Does the valve run any easier than one which just covers the inside ports? *A.*—No. 3. Please explain fully the use of the extra ports. *A.*—You will notice that near the end of the stroke the piston covers the inner port, thereby terminating the exhaust; at this point the outer port is covered by the valve, so that the steam which remains in the cylinder is entrapped and forming a cushion. In short, the purpose of the two ports at each end is to obtain a cushion; without this the piston would strike the cylinder head

(173) C. A. J., Chattanooga, Tenn., writes: A grindstone 5 feet diameter, 2 feet wide, is running at a speed of 175 revolutions per minute under a pressure of 2,016 pounds, equally distributed on the surface. What will be the horse-power required to drive it? *A.*—Its circumference is 15.7 feet, and its surface velocity will be $15.7 \times 175 = 2{,}747.5$ feet per minute. The coefficient of friction will depend on the kind of stone; assuming this coefficient to be .25, then the resistance to be overcome will be $2{,}016 \times .25 = 504$ pounds. The horse-power required to drive the stone is found by multiplying the surface velocity by the resistance, which gives the total amount of work performed, and dividing this by 33,000 gives the horse-power required. Hence we have $\frac{2{,}747.5 \times 504}{33{,}000} =$ 41.9 horse power. If the coefficient of friction is greater than that which we have adopted, the horse-power will be increased correspondingly.

(174) G. H. L., Toms River, N. J., writes: Kindly inform me through your columns what you think of a marine boiler constructed of common steam pipe? I want to build one about 2 feet diameter, 3 feet high and 3 feet long, and something on the style of the inclosed sketch. About what pressure do you think it would stand, and what size of pipe had I better use? Do you think it will be about the right size for a 4x4 inch engine? I want it to run a boat whose length is 24 feet, 7 feet beam; I intend to use a 24-inch propeller. *A.*—A good water-tube boiler should stand a pressure of 300 pounds. We should use 1-inch pipes. The boiler should have about 60 square feet of heating surface. We cannot express an opinion on the boiler you intend to build, because you did not inclose the sketch to which you refer. There are many water-tube boilers now in use giving excellent satisfaction. It seems to us that you can buy one cheaper than you can make it, and in so doing you will not run the risk of infringing on other makers' patents.

(175) J. B. H., Clarksburg, W. Va., writes: Do you think it is advisable to run a 14x20-inch engine with a shaft governor operating a single valve? We have built engines of this size, but have never used a shaft governor on them, fearing that the compression would be too high. Is this correct? *A.*—There are many engines made with a shaft governor operating a single valve, and have given excellent satisfaction. You will find a number of this class of engines illustrated in our pages. It is true that the compression under some circumstances will be high, but if the engine has a suitable amount of clearance, and the valve is actuated by a correctly designed governor, the compression should not rise to any hurtful extent. Valves in this class of engines should also be balanced, not simply for avoiding the loss due to friction, but so as to admit the use of a large valve and a large travel, giving ample port opening both for admission and release of steam, and enable the governor to handle it. 2. We wish to get an indicator; kindly tell us which is the best. *A.*—We would be doing an injustice to some makers of indicators by recommending a particular kind. You must make your own selection. There are several good ones.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

Gear Book, gratis; see page twenty.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Ideal Drawing Stands. M. C. Hammett, Troy, N. Y.

Forming Lathes, Mer. Mach. Tool Co., Meriden, Ct.

A. D. Pentz, Consulting. Tools. Elizabeth, N. J.

See Gage advertisement below.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

Gage Tool Co.'s Self Setting Plane does more and better work in less time. On trial. Vineland, N. J.

Drop Presses, Punches and Shears. Williams White & Co., Moline, Ill., manufacturers.

For Foundrymen's Metallic Pattern Letters and Figures, send to Knight & Son, Seneca Falls, N. Y.

Pattern and Brand Letters. A variety of sizes and styles. Heber Wells, 8 Spruce St., New York.

Davis Key-Seating Machines kept in stock by Manning, Maxwell & Moore, 111 Liberty St., N. Y.

Selden Packing for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt St., N. Y.

S. A. Smith, 23 S. Canal St., Chicago, Ill., is agent for Holbrook's new loaded rawhide mallets.

"Boiler Tests by Barrus." Get sample pages from Gowing & Co., Mason Building, Boston, Mass.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus air pumps, acid blowers, filter press pumps, etc.

For the Latest Improved Diamond Prospecting Drill, address the M. C. Bullock Mfg. Co., 138 Jackson St., Chicago, Ill.

S. W. Card & Co., Mansfield, Mass., are putting on the market a new line of stocks and dies, with their patent adjustable dies and guide S. A. Smith, 23 S. Canal Street, Chicago, Ill., western agent.

25″ } "Only Drill Press built on
32″ } 'Ko-rekt' principles,
37″ } Even if they come from Jersey."
42″ } Gould & Eberhardt, New Ark, N. J.

Complete treatise on Screws and Screw-making with clear and concise explanation of the methods; 95 illustrations. Price, $1.25 postpaid. E. & F. N Spon, 12 Cortlandt St., N. Y.

Patent Soliciting of High Class.
D. Walter Brown, Counsel in Patent Cases.
31 Nassau street, New York.
Send for Brief History of Patent Legislation.

We will pay 25 cents each for copies of the AMERICAN MACHINIST of December 25, 1886 issue; must be unsoiled, and in good condition. AMERICAN MACHINIST PUBLISHING COMPANY, 96 Fulton Street, New York.

De Lamater Screw Propeller Wheel, made only by The Samuel L. Moore & Sons Co., Elizabethport, N. J., who have purchased from C. H. De Lamater & Co., New York, all their patterns, books of record, gauges, etc. Location and equipment well adapted for Heavy Steamship Repairs.

"Binders" for the AMERICAN MACHINIST. Two styles—the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers with full page opening flat. Either will hold the entire 52 issues of any volume. American Machinist Publishing Co., 96 Fulton St., New York.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator and making all required calculations from the diagram, also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price, $2 postpaid. Published by John Wiley & Sons, 53 East Tenth Street, New York.

Inaccurate Gauges—High Class Machine Work.

BY W. H. BOOTH.

For the ordinary run of work a set of gauges accurate to .0002″ can scarcely be condemned as unfit tools by which to work. If it could be secured that the gauges of different workshops agreed within this quantity it would be possible to feel easier than one can sometimes do when assembling details. Only recently I had occasion to have made at two places—a couple of hundred miles apart—a shaft and a wheel. What I ordered was a shaft turned to 2″ diameter from one man, and from the other a wheel bored so as to be a good sliding fit on a 2″ shaft, explaining that the wheel would slide on a feather key. When I received the shaft I found it as much in excess of 2″ as the bore of the wheel should

have been, and anticipated trouble and a non-fit, but the wheel arrived with a bore so much in excess of 2″ that it was barely as tight a fit as it should have been, in spite of the excess of shaft diameter.

Fortunately, both errors were in the same direction—a mere chance this, and the errors in both articles were far in excess of what they would have been had even cheap gauges been worked to by both shops. Now for the class of work—a gear for driving a pump—it is reasonable to suppose that had each article been made at the respective shops to fit closely, but not tightly, upon or in a fair plug and ring gauge, even if these had each an error in the direction of tightness of $\frac{1}{5000}$″, the articles when finished would have been at most a very close fit, which have been made easy enough by revolving the wheel upon the oiled shaft; and herein lies the beauty of even cheap gauges correct to $\frac{1}{5000}$″ as compared with ordinary work. Had my details been thus made, I should have been satisfied; but now I am not satisfied, as the present diameter of the shaft implies that a gauge ought to be made to it, and put away where it will (not) be found when a new wheel is wanted, or the shaft will need to be measured when such time arrives. Likely enough it will be greasy and dirty, and being so near 2″ will be called so, and the new wheel—perhaps bored by a man who bores within $\frac{1}{5000}$″—will be too small, and there will be a filing job to be done where no file is. This sort of thing annoys one.

Probably not a large proportion of the readers of the American Machinist really know from their daily experience what accurate work means; and, indeed, in a mechanical sense the term has no fixed meaning either for machinists at large or for any definite period of time.

In the early Boulton and Watt daysit is recorded that Boulton wrote a cheerful letter on being successful in constructing a cylinder boring machine so accurate that a half crown (size of 50c.) could not be got between the cylinder and piston anywhere.

More recently, and it is to be feared too often at present, a sixteenth of an inch would represent accuracy in the coincidence of the punched rivet holes of a boiler, and at the present day the accuracy necessary to be observed in building a locomotive does not compare with the accuracy of the parts of a sewing machine, a gun-stock or a watch. It is purely a relative term, and is interpreted by every man according to the class of work on which he may be engaged, and resembles the oft-quoted standard, "as big as a piece of chalk." We understand well enough what this is, but in the chalk pit the quarrymen.

To-day I dropped into the office of an American engineer in London, who is not unknown in the office of the American Machinist, and the conversation turned upon good machine work. The American had been brought up in one of the best American works, building articles in quantity on the most complete interchangeable system, and he showed me certain portions of a machine, first as forgings, then as they came from the machine, and finally finished. Nothing could have been better in any way either in the neatness and nicety of the forgings and freedom from excess of stock; and the machining was simply perfect, and it was clear that the tools employed must have been maintained in a high degree of excellence. He then informed me that these various articles were made in Germany, and not only so, but that the tools by which they were made were also made in Germany.

It is very much the custom here, just as it is in America, to decry anything of foreign make as utterly inferior to what we highly superior Anglos can produce, and yet here in London an American, of all others, who knows what the best American practice is, and will tell you this of Brown & Sharpe and that of Pratt & Whitney, and knows the strong or weak points of the two shops, shows me work done in Germany by Germans with German tools, which I cannot fail to see is simply superb, and which the American tells me is better than anything produced in America, and that the German tools are not equaled by anything either in America or England. I am promised to see some of the German tools before long.

As my friend says, if you want good work you have got to pay for it, and accuracy cannot be had in cheap tools—not the accuracy of the finest sense.

Though I had been previously aware that there were firms on the Continent which turned out the very best of engine work, I had not been previously brought into contact with such specially high class work as was to day shown me, nor do I regret seeing it. If Germany is going to turn to making high class machinery there will be a tendency toward an improvement all round, and the desperately inferior German rub bish—for this term does still describe very much stuff sent forth by the Fatherland and stamped as English—will perhaps diminish.

Then, again, we shall have some of this German machinery in England—an advantage which America loses. We shall get it here, and our tool makers will have an added incentive.

As my American friend spoke of things as he found them, I asked him his opinion as to the relative qualities of English and American fine gauges, micrometers, etc. He said that as regards accuracy there was nothing superior to English made articles, but he objected to their style and pattern as being too heavy. This, no doubt, is a very fair criticism—things are often made too heavy here, which, perhaps, accounts for the excellence of English heavy tools where the anvil principle is required, and gets it perhaps better than where lightness is too much sought after. More might be said here, but I must refrain from using the columns of the American Machinist for advertising, and so do not give names, or perhaps I could have made what I have had to say of much more interest. In the meantime, Connecticut should keep an eye on Germany, which is certainly not standing still on the question of high class tools.

On this side the water people are not really frightened by foreign competition, and everything comes in free that is worth having, and we use just what we please without fear or favor. English tool steel, American hack saws or chucks, springs from Sweden, drop forgings from Germany and France all go to turn out work for which I am responsible.

A bill is now before the Legislature at Albany, the provisions of which call for the filling in of the Albany basin. This basin is a part of the Erie Canal, and its filling in is justly looked upon as a blow at the canal in favor of the railroads. It should never become a law. The canals of New York State should be preserved to the people. They form a safeguard against extortion that should not be surrendered.

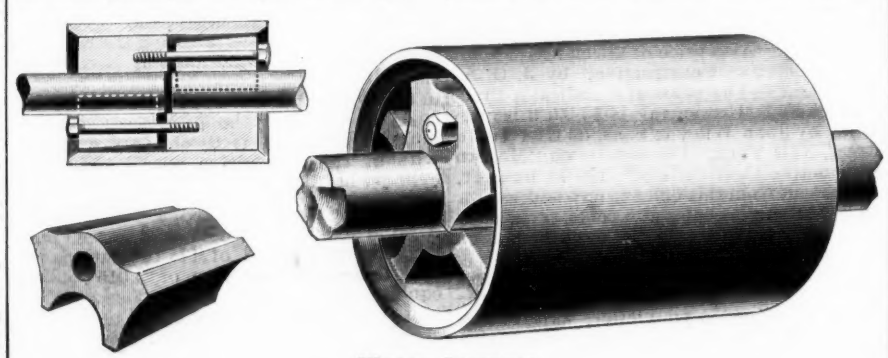
The existence of a new danger in railroad traveling was shown by an accident which occured a short time ago, on the Erie road. Gas from one of the reservoirs is supposed to have leaked into the closet, and when the conductor came through the car, and, after the manner of conductors, opened the closet door and thrust his lantern into it to see if it were occupied, an explosion took place which injured him and fired two cars, which were consumed.

A remedy will no doubt be found for leaking gas, but what we have to suggest is some device which will show at a glance whether or not a car closet is occupied. It would seem as though passengers ought to be spared from parading the full length of a car while in motion, to try a closet door, before they can know whether it is occupied or not; and to find it occupied, and to have to parade back again is, to say the least, rather embarrassing for most people.

Wedge Coupling.

The illustrations show a very simple and effective shaft coupling, in which wedges are used for securely fastening the coupling to the shafts. The outer form of the coupling is similar to that of a pulley; the four arms and the hub are arranged so that one-half the length of the hub surrounds nearly one-half the circumference of the shaft, and the remaining length of the hub surrounds the opposite side of the shaft, as shown in Fig. 1. Opposite the bearing surfaces of the hub, wedges of the form shown in Fig. 2 are driven between the shaft and the rim of the coupling, the rim having inclined surfaces against which the wedges bear; by these means the coupling is securely fastened to the shafts. For an extra safeguard, studs through the wedges are employed which prevent them from becoming loose.

It will be readily seen that, since the wedges are at the opposite sides of the shaft, and at opposite ends of the coupling, no special tools are required for attaching or removing the coupling; all that is needed to attach it is a hammer for driving the wedges, and a wrench for tightening the nuts on the studs; for removing, the same tools, with the addition of a small iron bar to reach the inner ends of the wedges, are used.



Wedge Coupling.

The stress on the coupling is equally divided, and the coupling is well balanced. It has necessarily a wide face, and since there are no projections at the ends it can be used for a pulley when it comes on the right place on the shaft.

These couplings are manufactured to suit various diameters of shafts by the patentee, Robert J. Stuart, New Hamburgh, Dutchess Co., N. Y.

The *Industrial World* says: "It is sometimes said that scientific men have never invented anything; but this is not true of Dr. Otto, who is known all over the civilized world as the inventor of the first economically and commercially successful gas engine."

So far as the foregoing relates solely to Dr. Otto's invention, it is undoubtedly true. But this is the first time we ever read or heard that any one was so rash as to make the statement that "scientific men have never invented anything." Science is a very comprehensive word, and it is rather generally believed that every one who invents anything of much consequence must be possessed of more or less of scientific attainment. But, limiting the meaning of the word to almost any extent, it is well known that scientists have always invented many of the instruments they use in their investigations, and have many times made other important inventions.

A correspondent asks several questions, involving, in their answering, a considerable knowledge of patent law. He should apply to some reliable patent attorney, who for a moderate fee will answer his questions more satisfactorily than we can.

The Midland Railway of England, in addition to the free passes to their workmen, will hereafter issue tickets for employes and their wives at one quarter fare

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MANUFACTURES

The City Railway Company of Lansing, Mich., will erect a new power house.

The Richmond Factory, Augusta, Ga., will be refitted with new machinery.

The City & Suburban Railway Co., Savannah, Ga., will erect an electric-power plant.

The Dickson Car Wheel Co., of Houston, Texas, has increased its capital stock from $50,000 to $75,000.

Exeter, N. H., is to have a new industry in the shape of a shop for the covering of drop forgings with rubber.

The Rosedale Pressed Brick and Terra Cotta Company, a $30,000 concern, will manufacture at Toronto, Ont.

The Rome (Ga.) Manufacturing Co. has been incorporated, to manufacture tea kettles and boilers capital, $15,000.

The capital stock of the N. B. Abbott Machine Company, at New York, has been increased from $100,000 to $125,000.

It is said that the capital of the Sterling Iron Company, of New York, has been reduced from $2,300,000 to $1,250,000.

It is reported that N. E. Ayer & Co. will establish a rolling-mill at Portland, Ore., for the manufacture of merchant bar-iron.

Joseph Hall & Co., of Richmond, Va., have sold their iron works, and are looking for a new and larger site for a new plant.

H A. Wrench, W. B. Farravand and others are endeavoring to organize a stock company to erect a cotton-mill at Dalton, Ga.

A branch of the St. Charles Car Works has been established at Denver, for the repair of cars. It may be enlarged for building cars.

It is stated that the Louisville & Nashville system is preparing to build a machine shop and foundry at Long Beach, Mississippi.

Reed & Howe are endeavoring to induce a capitalist to erect a plant at Tallapoosa, Ga, for supplying power to small industries.

Wm. Berney and others propose to organize a $50,000 stock company, to establish a 3,500 spindle cotton-mill at Birmingham, Ala

The C. F. Monroe Company, capitalized at $40,000, has been organized at Meriden, Conn., to manufacture glassware and metals.

The Vancouver Dynamite and Powder Company, capitalized at $100,000, will manufacture powder, dynamite, etc., at Vancouver, B. C.

The Queen City (Texas) Iron Company will erect a 50-ton blast furnace and have the same completed and in operation inside of 18 months.

The new machine shop of Bartlett, Marsh & Co., Concord, N. H., is completed. The building is 50x23 feet, with two stories and a basement.

A report is current that Massachusetts capitalists will erect at Nottingham, Ala., a cotton-mill of 40,000 spindles and 1,000 looms, at a cost of $400,000.

The Carlin Manufacturing Company will shortly double the capacity of its foundry in Allegheny, Pa., by the erection of an iron-clad building 50x100 feet.

The Louisville Contracting Co., with a capital stock of $10,000, has been incorporated at Louisville, Ky., for constructing bridges and new railway work.

The Lansing (Mich.) Iron and Engine Works are closed for the annual inventory. During the shutdown, extensive repairs and alterations will be made about the plant.

The Missouri Valley Bridge and Iron Works, of Leavenworth, Kan., will build the $175,000 steel bridge connecting Galveston island with the main land at Galveston, Texas.

Wm. J. L'Engle, Thos. H. Harris, John Peabody and others have incorporated the Capital Ice Co., at Atlanta, Ga., to manufacture and deal in ice. The capital stock is $10,000.

Fred Noelke will build iron bolt works on a three-acre tract on Madison avenue, Indianapolis, Ind., bought of the Fenniman estate for $6,000. Some $20,000 will be invested in a plant.

The Kimball Electric Railway Equipment Co., of Chicago, has been incorporated by Daniel E. Kimball, Albert L Allen, W. R. Payne and Isaac Bassford, with capital stock of $300,000.

Bedford, Ind., will have water-works, two new depots, a new foundry and machine shop, a new stone-mill, and will witness the opening of several new quarries during the coming summer.

The Walburn-Swenson Manufacturing Co., at Fort Scott, Kan., has erected a small experimental concentrating plant, with a capacity of 10 to 20 tons per day, for the purpose of testing ores.

Contracts are about to be let for the erection of the buildings of the South Boston Iron Works, at Middlesborough, Ky. The plant is expected to be running in September and will employ 500 men.

The Ray Valve Manufacturing Company have been incorporated at Elizabeth, N. J. The capital is $100,000, one-half of which is paid in, and will be used in starting works in Linden County, N. Y.

The Capital Construction and Investment Co. has been chartered at Little Rock, Ark ; capital stock, $100,000. H. G. Fleming is president ; Geo. R. Brown, vice-president, and H. P. Bradford, secretary.

Theo. Audel & Co., 91 Liberty street, New York, have issued a catalogue of mechanical, engineering and scientific books, in which those interested in such works are likely to find the titles of something that they want.

The iron framework for one of the two new mills of the Sterling Steel Co., in McKeesport, Pa., has been raised. The building will be 75x100 feet. The other building will be pushed forward as rapidly as possible.

Negotiations are in progress with the Holland Radiator Manufacturing Co., of Chicago, Ill., looking to the establishment in Harriman, Tenn., of a plant for the manufacture of steam and hot water radiators, etc.

The Magnolia Compress and Warehouse Co. has been incorporated, with a capital stock of $100,000, to erect a cotton compress at Mobile, Ala. The incorporators are L. C. Fry, Winston Jones, Bernard Kahn and others.

The New South Machinery Company has applied for a charter to manufacture and deal in machinery and machine supplies at Atlanta, Ga. F. K. Adams and associates are the incorporators, and have a capital of $5,000.

George C. Hackstaff, president of the Clinton Iron, Coal and Railroad Company, of Clinton, Tenn., was in New York recently for the purpose of making arrangements for the erection of an iron furnace at Clinton.

The New York Automatic Salesman Co., capital $100,000, paid in $100,000, has been organized at Lewiston, Me., for the purpose of manufacturing special machines. President is Boyd B. Jones, of Haverhill, Mass.

The Anthony Phosphate Co. has been organized at Anthony, Fla., with J. W. Wells, of Winter Park, as president, and H. S. Kedney, secretary ; capital stock, $100,000. The company will develop phosphate mines and erect a 100-ton plant.

Chandler & Taylor Company, Indianapolis, Ind., are bringing out a complete new line of saw-mill machinery, which will be ready for the market early in the summer. The Heacock patent variable belt feed works will be used on all mills.

The Sioux City (Iowa) Inter-State Bridge Co. has been incorporated, with a capital of $2,000,000, for erecting, maintaining and operating a bridge across the Missouri River, at or near Sioux City; incorporators, John Pierce, Wilbur Owen and others.

The American Electric Railway and Illuminating Co. has been chartered at Birmingham, Ala., by J. M. Billups, Jr., W. P. Curtis, of New Orleans, La., and F. C. Dunn. It proposes to manufacture and furnish electric light, etc ; capital stock, $50,000.

There is water-works agitation in Lenoir, S. C.; Elgin, Ill.; Orange, Mass.; Napoleon, O.; Ft. Valley, Ga.; Independence, Ore.; Saratoga, Wyoming; Walla Walla, Wash.; Carrollton, Ga.; Bedford, Ind.; Hartley, Texas; Midlothian, Texas; Weirs, N. H.; Tacoma, Wash.; Arlington, Ore.

Application for a charter of co-operation has been made by the Acme Car Coupler Company, of Pittsburgh, for the manufacture of car couplers. Those interested in the new enterprise are Alfred A. Pope, J. H. Whitmore, George H. Hopper, John Simpson, Charles P. Krauth and Henry C. McCoy.

The New Castle Car Manufacturing Co., of New Castle, Pa., is a newly incorporated concern for the construction of railway passenger coaches. E. N. Baer is the treasurer of the company. Other interested persons are Wm. M. Brown, S. P. Emery, John H. and Geo. L. Vogan. The capital stock is $25,000.

The additional machinery recently erected by the Springfield Iron Company, of Springfield, Ill., has greatly increased its capacity for the production of track bolts. The company will soon be in a position to increase its output 50 per cent. more than was possible before improvements were made.

The Berlin Iron Bridge Co., East Berlin, Conn., have taken the contract to build a producer building for The Solvay's Process Co., of Syracuse, N. Y. The building will be 30 feet wide by 100 feet long, and three stories high, built entirely of iron, even the floors being made of plate-iron, in order that there may be no wood-work about the building to take fire.

The Baltimore & Ohio Railroad Company has made the city of Cumberland, Md., the terminus for three of its divisions, and have purchased twenty acres of land immediately adjoining the works of the Cumberland Steel and Tin-plate Company, upon which they will erect large shops. It is estimated that the shops will give employment to about 1,000 hands.

The Lodge & Davis Machine Tool Co., works, Cincinnati, Ohio, have just opened a new machinery store in Cleveland, Ohio, at No. 32 South Water street, for the exhibition and sale of their machine tools. They will carry a complete line of their latest designed and most improved tools, and say they will be prepared to give quick delivery, as the growing trade of Cleveland and vicinity demands.

Machinists' Supplies and Iron.

NEW YORK, April 16, 1892.

Iron—American Pig—We quote Standard Northern brands, No. 1 Foundry, $15.75 to $16; No. 2, $14.75 to $15; Grey Forge, $13.75 to $14. Southern brands of good quality are obtainable at $15 to $15.50 for No. 1 Foundry; $14.25 to $15 for No. 2; and $13 to $13.50 for Grey Forge.

Scotch Pig—Coltness is quoted at $21; and $20.25 for Eglington.

Antimony—The market is unchanged.

We quote Hallett's, 10¾c. to 11c.; Cookson's, 14½c. to 15c.; and L. X., 13c. to 13½c.

Copper—The market is more or less nominal, with little indication of business. Lake Copper is quoted at 11.95c. to 12½c.; but views of the buyers are not above 11.75c. to 11.80c. Casting copper is quoted at 11.35c. to 11.75c., according to quantity.

Lead—The market is firmer. Holders are asking 4.27½c. to 4.30c., and buyers seem disposed to pay 4.25c. The movement is reported light.

Lard Oil—The market is firm at 56c. to 57c. for Prime City. Western on spot is quoted at 55c. to 56c.

Spelter—Carloads can be had at 4.65c. for New York delivery of some brands, while 4.55c. is bid. No fresh business has been done for some days. Smelters are inclined to entertain firm views.

Tin—The feeling is a little firmer, with spot quoted at 20.05c. for 5-ton lots.

WANTED

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. Seven words make a line, and the address as desired to appear should be included. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Mechanical draftsman wants a situation. Address X., AMERICAN MACHINIST.

Wanted—Employment; 16 years' exp. in mfg., sale and erection of machinery. "Practical," AM. MACH.

Mechanical draftsman of 1st-class ability desires position in N. Y. or vicinity. Box 93, AM. MACH.

Wanted—Position by expd. man as foreman of boiler shop; N.Y.State pref'd. Enterprise, AM. MACH.

Wanted—Draftsman; machinist with technical education and holding position as leading draftsman desires a change. Address 32, AM. MACHINIST.

Wanted—Machinists for day and night crews. Steady work for good men. The Shaw Electric Crane Co., Muskegon, Mich.

Wanted—A position by a mechanician accustomed to fine model and instrument work; 9 years' experience. Best of references. L. X., AM. MACH.

Wanted—A skilled machinist to instruct students. State age, experience, and past wages. Address Box 94, AMERICAN MACHINIST.

Wanted—A first-class mechanical engineer, desires an agency or a position as salesman for New York and vicinity. Address B., AMERICAN MACHINIST.

Wanted—Machinist and draftsman wants situation as foreman or supt.; 5 years assistant foreman building pulp mach'y. L. N. Y., care AM. MACH.

Wanted—Position by 1st-class draftsman, designer and pattern maker, with 10 years' practical exp. as foreman. Address "Reliable," AM. MACHINIST.

Wanted—Machinist, 12 yrs' exp., wants responsible position in shop or as engineer. Address A. M. S., AMERICAN MACHINIST.

Wanted—For gray iron and malleable foundries, superintendents who have had experience in making agricultural castings. Walter A. Wood Harvester Co., St. Paul, Minn.

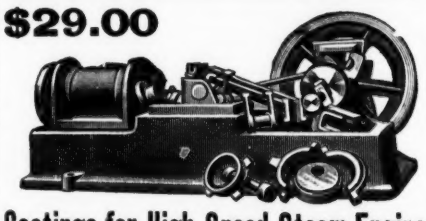
Wanted—By an experienced foreman molder, situation. Large exp. in loco., marine and stationary engine work, exp. in brass. Good references. Address Foundryman, care AMERICAN MACHINIST.

Wanted—Foreman. A live, energetic man, as supt. in a foundry doing engine and general mach'y business. Must be thoroughly posted in all modern methods in foundry practice. N., care AM. MACH.

Foundry foreman wants to change position. Long experience at sheave, gear and mill work; also on farm implements. Can handle men to an advantage. Address Box 89, AMERICAN MACHINIST.

An exper'd draftsman, holding resp'e position at present, wishes to change about May 1st. Posted on interchangeable work and the construction of special and gen. mach'y and tools. A. R., AM. MACH.

$29.00



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Sets of Castings for Engine illustrated above, with *Cast-steel Shaft, Connecting Rod* and *Rock Shaft* and *Brass Bearings*, boxed and shipped on receipt of $29.00. Three sheets *blue prints* of working drawings extra.

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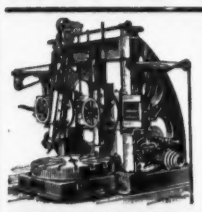

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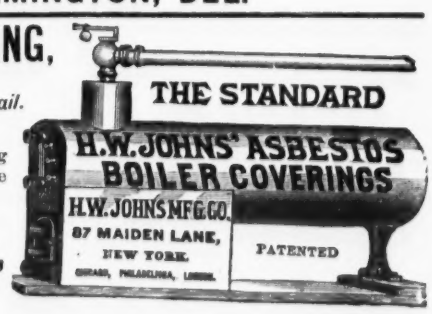

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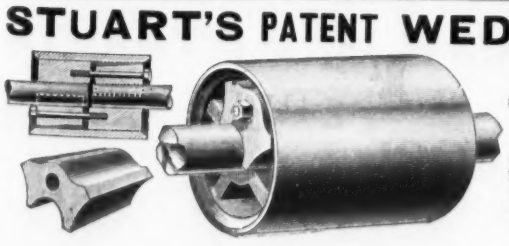

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Wanted—A first-class stove pattern filer, one that understands the correcting and adjusting of patterns in new work. Men that cannot work six days in the week need not apply. Address Z., care American Machinist.

Wanted—Foreman for large machine shop, with experience in steam engine work, and capable of handling large force of men on contract work. State salary, age and nationality. Address Box 91, American Machinist.

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Machine Tools in Stock.

ENGINE LATHES.

78 in. swing,	9 ft.	between centers		Sellers
38 do	17 ft.	bed.	New	Fifield
30 do	14	do	do	do
30 do	24	do	do	
27 do	16	do	do	
24 do	12	do	do	Fifield
24 do	12	do	do	Fitchburg
24 do	12	do	do	Flather
22 do	10	do	New Pattern	Fifield
22 do	12	do	do	do
22 do	12	do	New	Blaisdell
22 do	8	do	do	Flather
22 do	10	do	do	do
20 do	8	do	do	do
20 do	10	do	do	do
18 do	8	do	do	do
18 do	10	do	do	do
18 do	8	do	do	Blaisdell
18 do	10	do	do	do
16 do	6	do	do	Flather
16 do	6	do	do	Blaisdell
15 do	6	do	do	Flather
14 do	6	do	do	do
14 do	6	do	do	Blaisdell
12 do	6	do	do	do

PLANERS.

42 in. wide,	42 in.	high,	12 ft. long, 2 heads	Gleason
36 do	36	do	8 do	Pease
30 do	30	do	8 do	do
30 do	30	do	8 do	Whitcomb
30 do	30	do	8 do	Flather
26 do	26	do	6 do	do
24 do	24	do	6 do	do
24 do	24	do	6 do	Whitcomb
22 do	22	do	5 do	do
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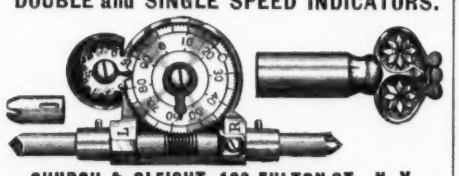

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✣ MISCELLANEOUS WANTS ✣

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Cheap 2d hd-lathes & planers. S. M. York, Clev'd, O.

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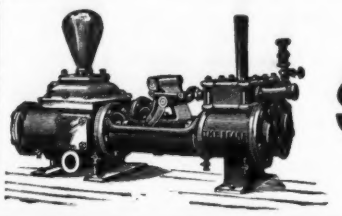

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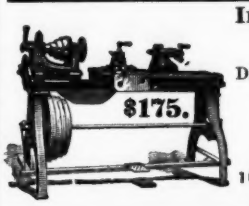

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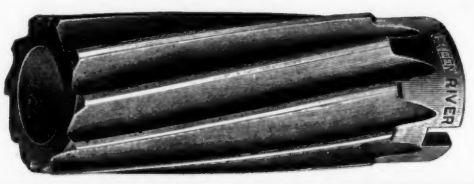

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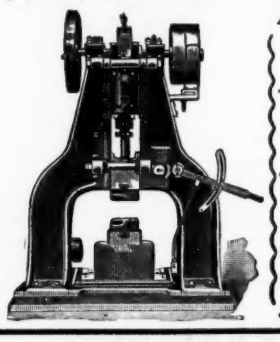

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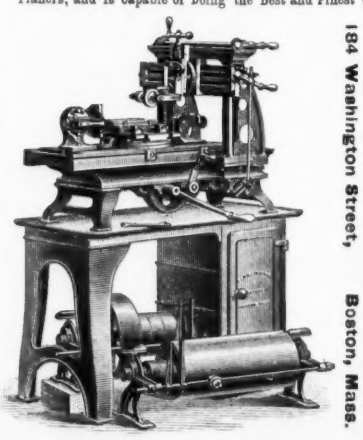

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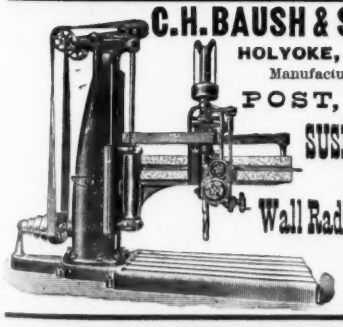

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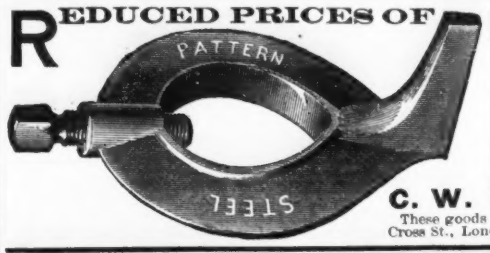

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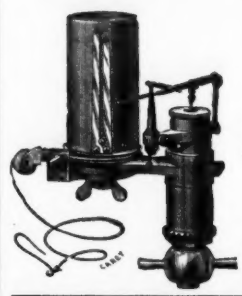

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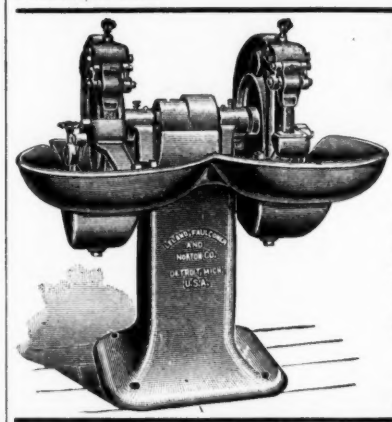

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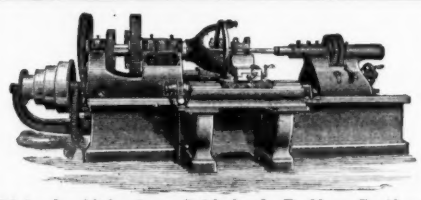

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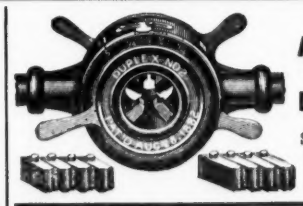

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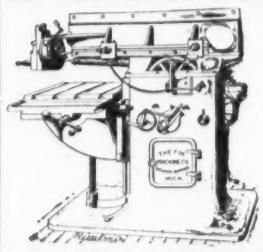

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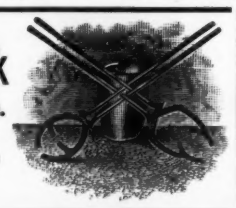
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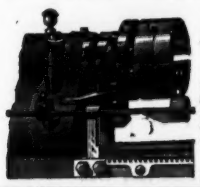
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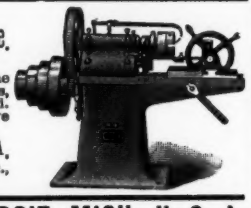

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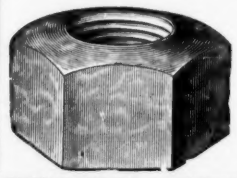
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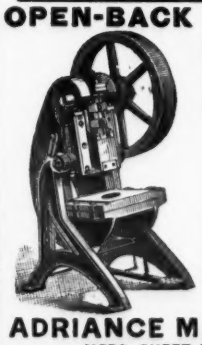
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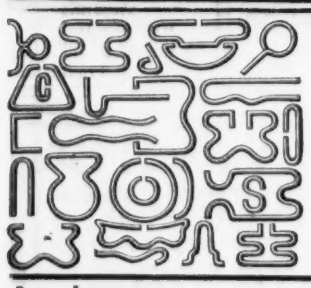
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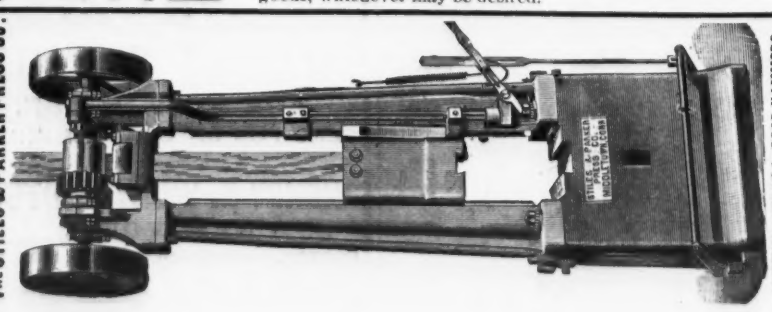
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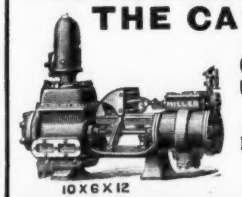
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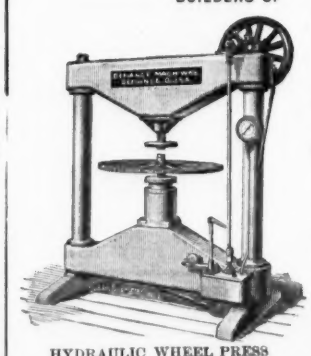
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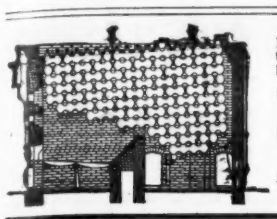

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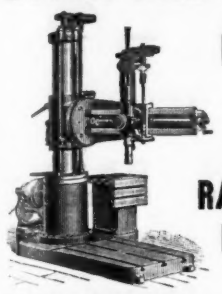

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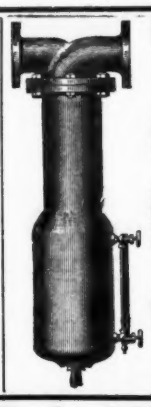

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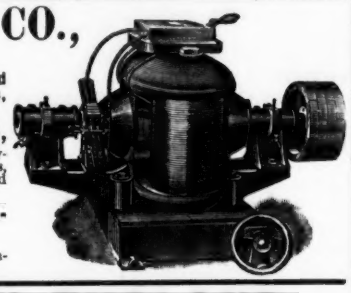

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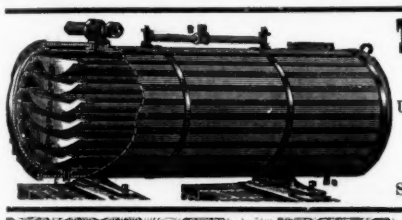

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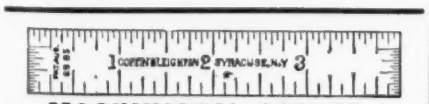

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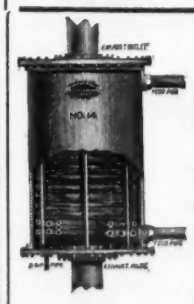

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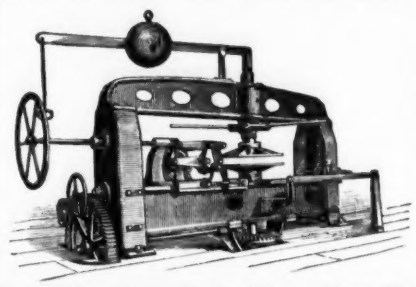

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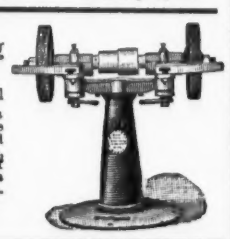

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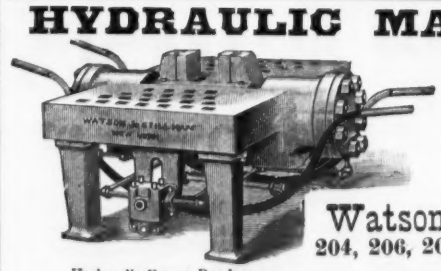

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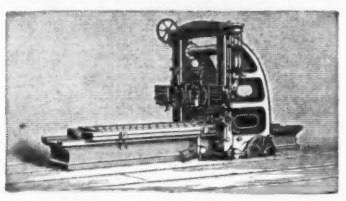

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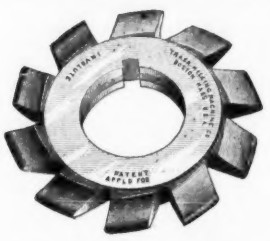

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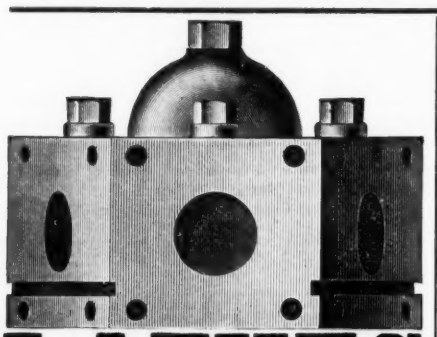

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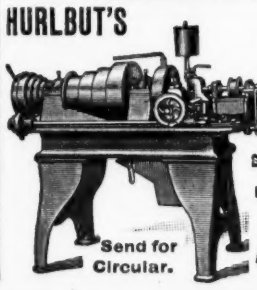

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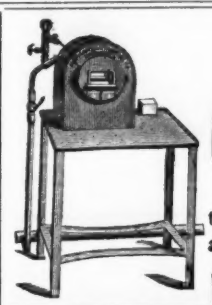

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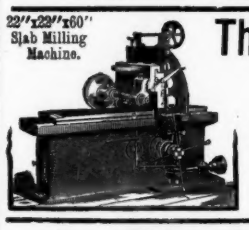

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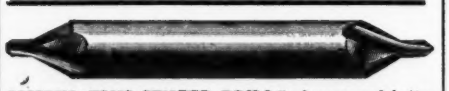

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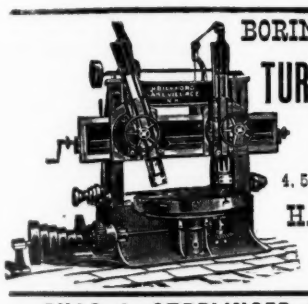

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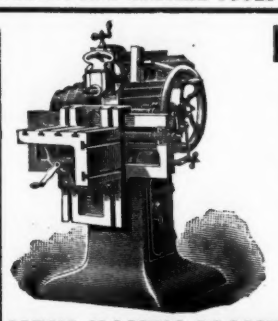

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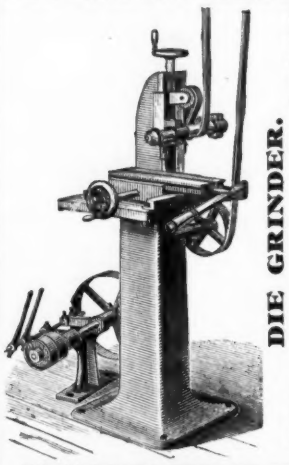

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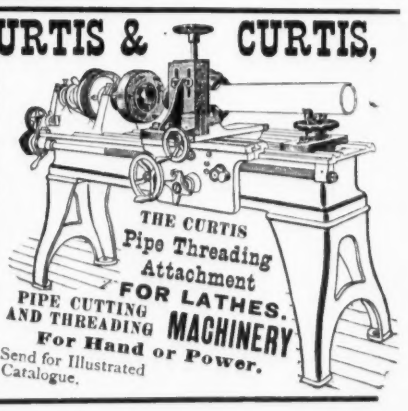

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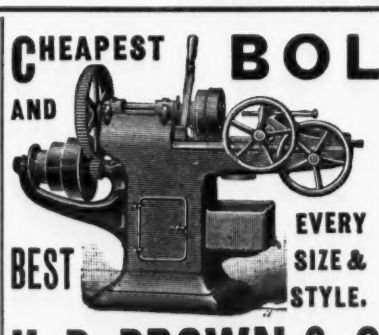

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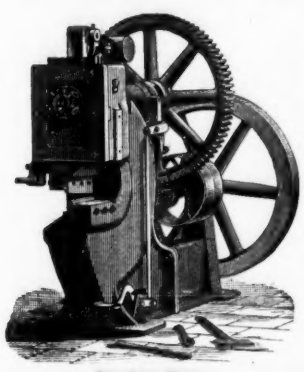

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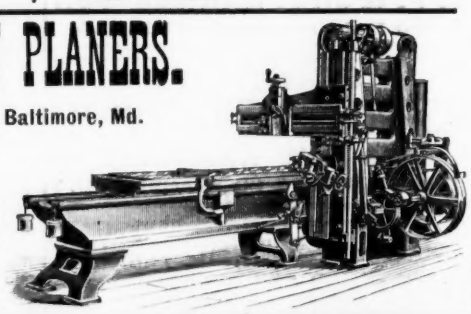

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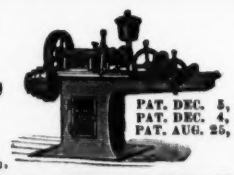

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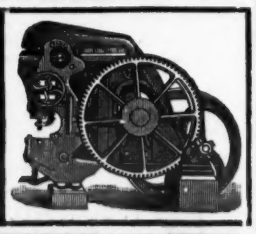

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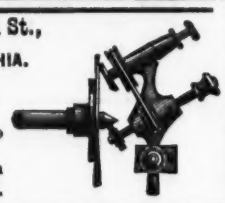

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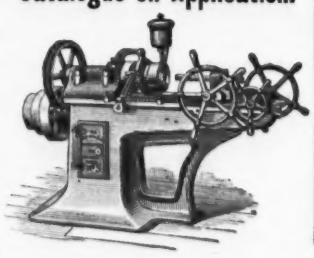

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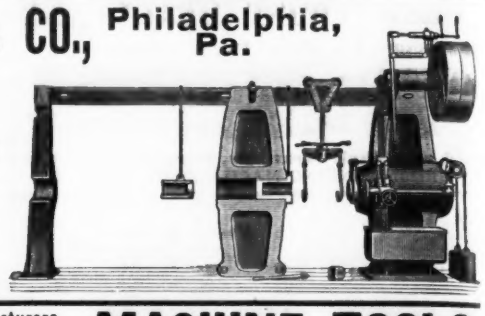

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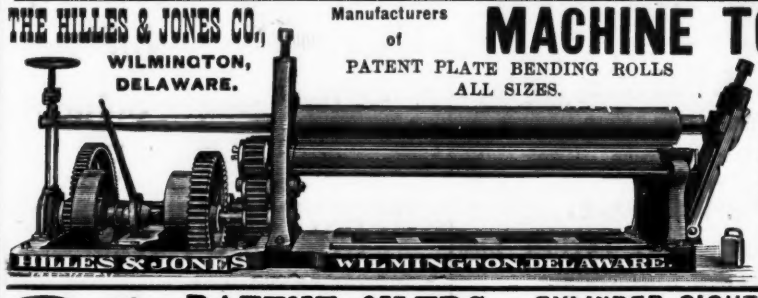

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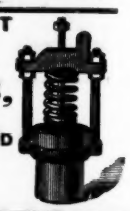

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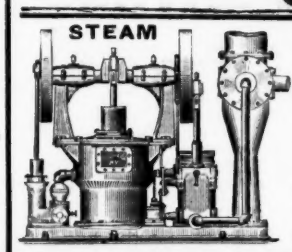

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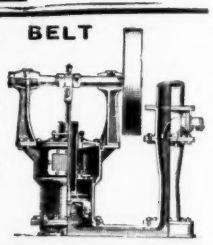

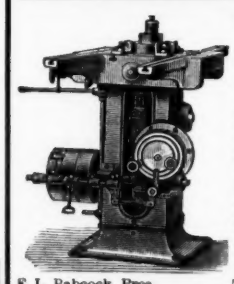

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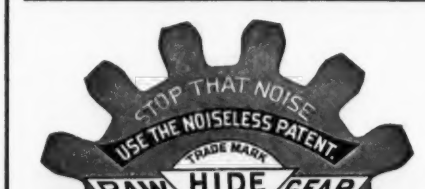

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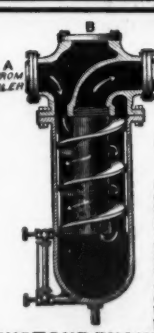

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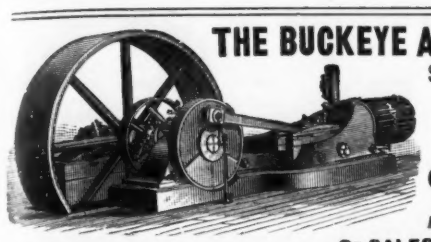

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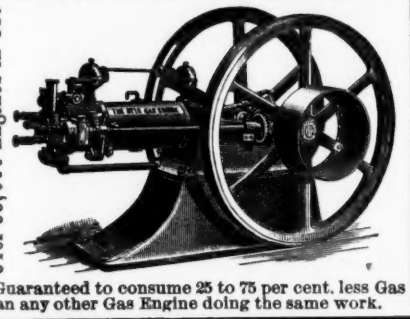

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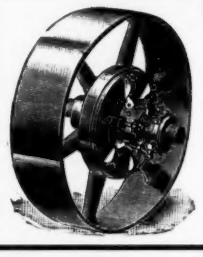

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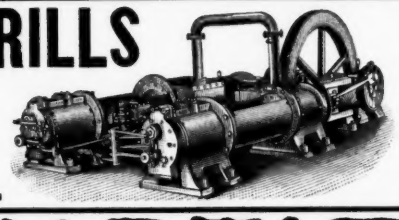

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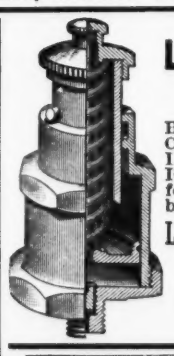

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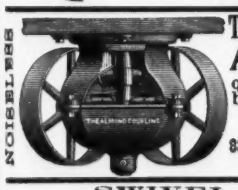

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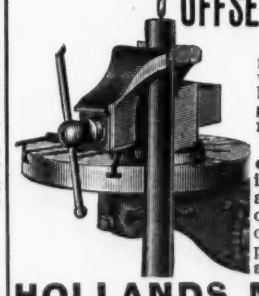

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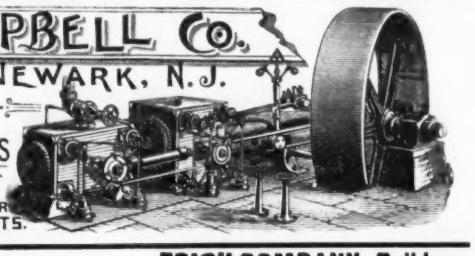

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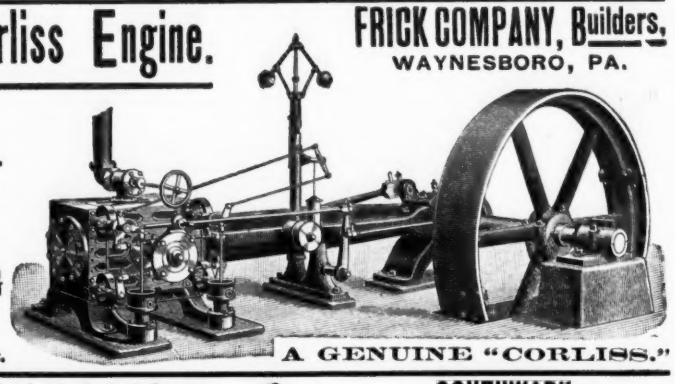

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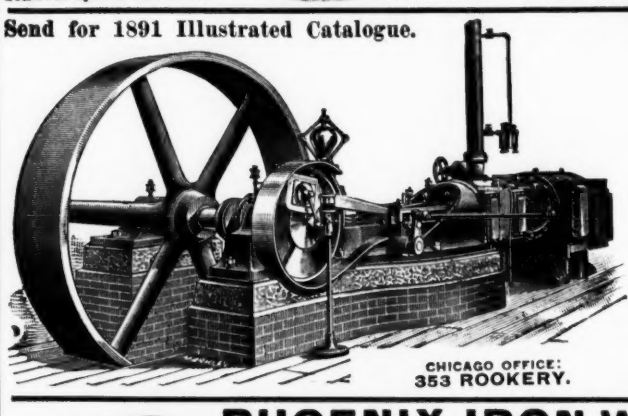

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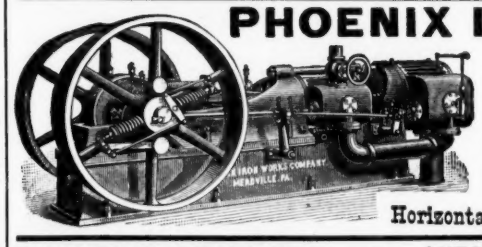

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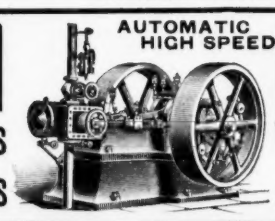

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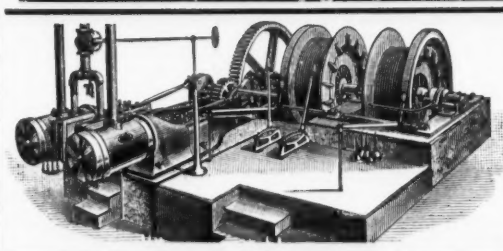

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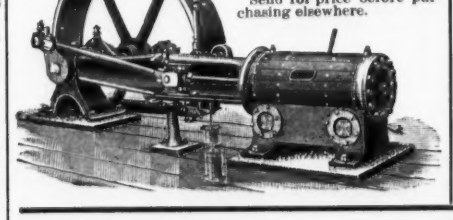

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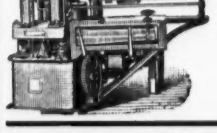

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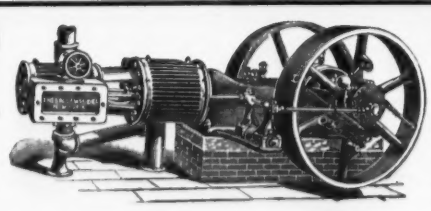

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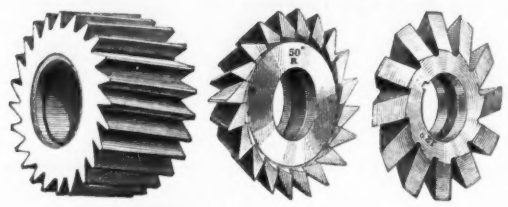

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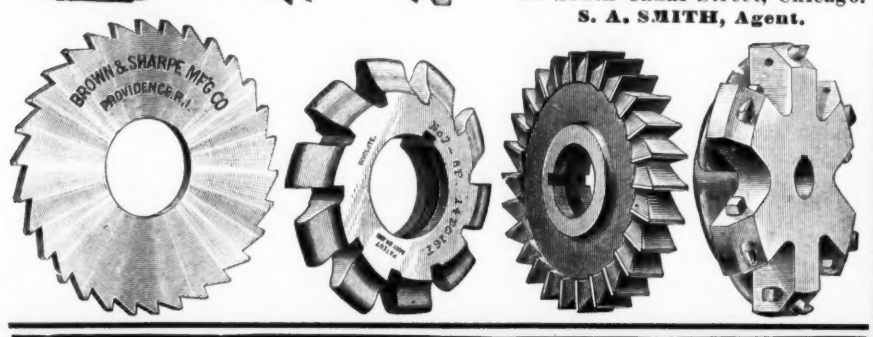

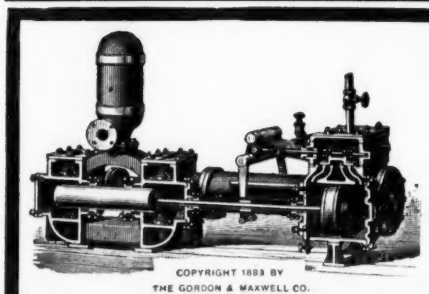

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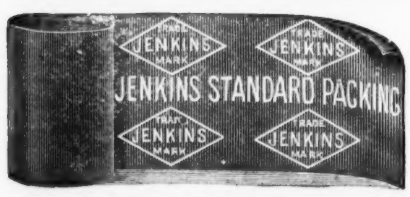

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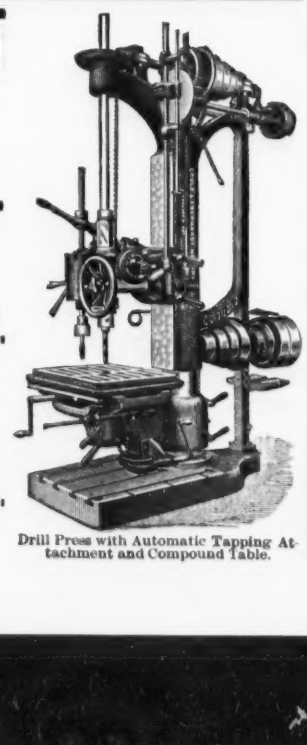

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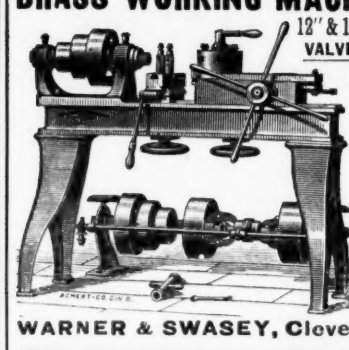

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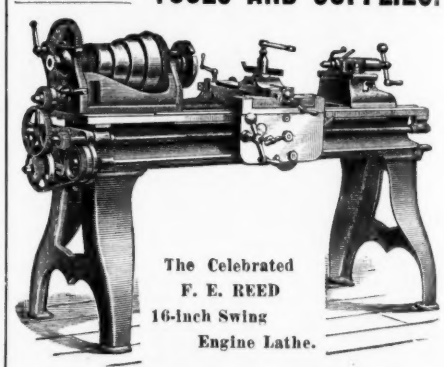

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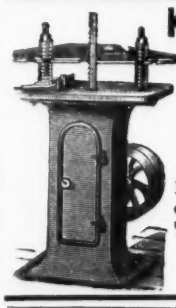

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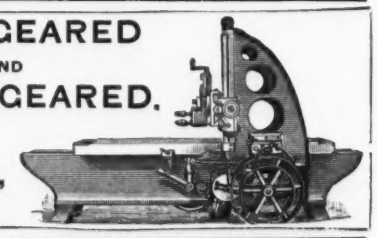

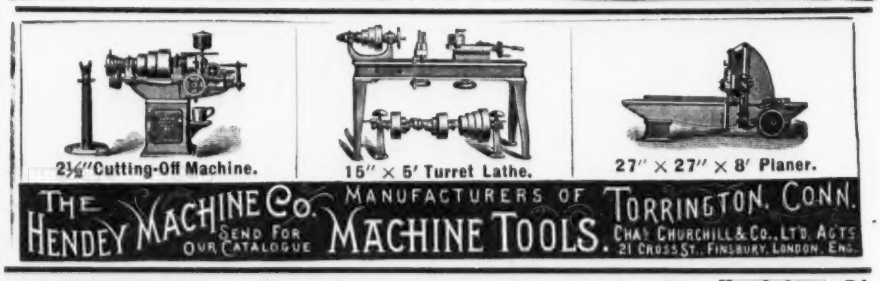

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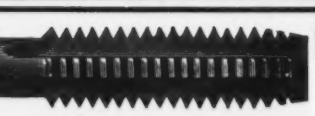

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